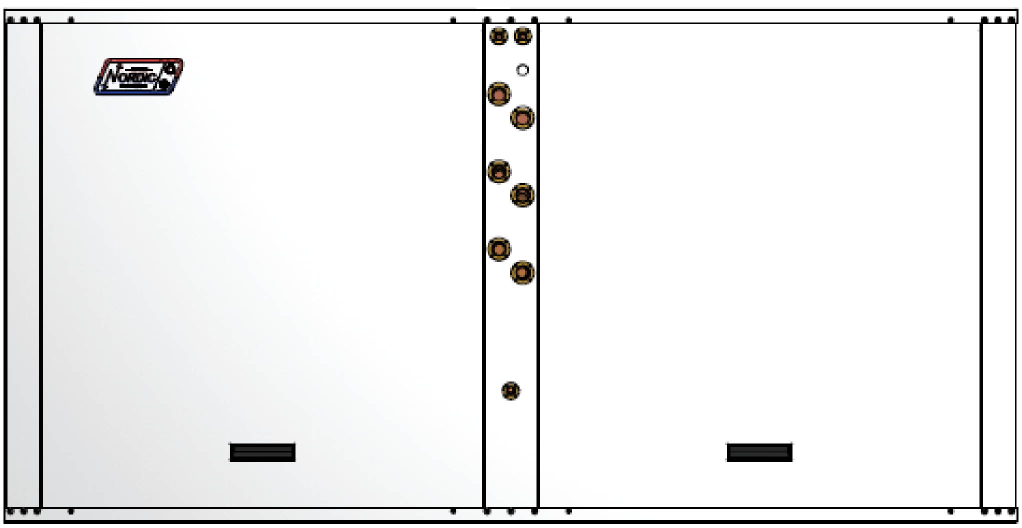
MARITIME GEOTHERMAL LTD.

Installation and Service Manual

NORDIC® EMWT-HSCW Series

Two-Stage R410a
Model Sizes 65-75

Two Tank Simultaneous Heating & Cooling Hydronic Geothermal Heat Pumps



C US

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SAFETY PRECAUTIONS

WARNING: **Ensure all access panels are in place and properly secured before applying power to the unit. Failure to do so may cause risk of electrical shock.**

WARNING: **Before performing service or maintenance on the heat pump system, ensure all power sources are DISCONNECTED. Electrical shock can cause serious personal injury or death.**

WARNING: **Heat pump systems contain refrigerant under high pressure and as such can be hazardous to work on. Only qualified service personnel should install, repair, or service the heat pump.**

CAUTION: **Safety glasses and work gloves should be worn at all times whenever a heat pump is serviced. A fire extinguisher and proper ventilation should be present whenever brazing is performed.**

CAUTION: **Venting refrigerant to atmosphere is illegal. A proper refrigerant recovery system must be employed whenever repairs require removal of refrigerant from the heat pump.**

MODEL NOMENCLATURE

EMWT—65—HSCW—P—1T—CC—12K—xx

Series:
EMW = Energy Module Liquid to water (Hydronic) with two tanks

Nominal Size:
65 = 5 Ton
75 = 6 Ton

Functions:
H = Heating
SC = Simultaneous Cooling
W = Domestic Hot Water

Refrigerant:
P = R410a

Voltage Code:
1 = 230-1-60 VAC
2 = 208-3-60 VAC
6 = 220-1-50 VAC
7 = 380-3-50 VAC

Revision:
01, 02 etc.

Electric Backup:
12K = 12 kW

Indoor Loop Exchanger:
C = Copper

Outdoor Loop Exchanger:
C = Copper

Compressor Stages:
S = 1 Stage
T = 2 Stage

APPLICATION TABLE

SIZE	FUNCTION	REFRIGERANT	VOLTAGE	STAGES	OUTDOOR COIL	INDOOR COIL	REVISIONS				
65	HSCW	P	1	T	C	C	07				
			2	T			07				
			6	T			07				
			7	T			07				
75	HSCW	P	1	T	C	C	07				
			2	S			07				
			6	T			07				
			7	T			07				

This manual applies only to the models and revisions listed in this table

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DIAGRAMS

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UNIT DESCRIPTION

The EMWT-Series unit is a high efficiency two-stage geothermal heat pump. Two-stage units offer a significant efficiency increase over single stage units when operating in the reduced capacity mode (Stage 1).

The unit contains R410a refrigerant, which is an environmentally friendly refrigerant. R410a is also a more efficient refrigerant than R22 or R407c.

The unit has several key features that are described in the specifications document for the particular heat pump. Please request a copy if desired or visit **www.nordicghp.com**

UNPACKING THE UNIT

When the heat pump reaches its destination it should be unpacked to determine if any damage has occurred during shipment. Any visible damage should be noted on the carrier's freight bill and a suitable claim filed at once.

The heat pump is well constructed and every effort has been made to ensure that it will arrive intact, however it is in the customer's best interest to examine the unit thoroughly when it arrives.

OPTIMUM PLACEMENT

The placement of a hydronic unit has negligible effects on the operation of the system. For ground water systems, the unit can be placed near the well water system, ground loop system units can be place near where the header pipes enter the structure to keep the ground loop piping, heat pump and circulator pump module in one location. The hydronic layout may make a particular location ideal for the unit installation.

If possible the access panels should remain clear of obstruction for a distance of two feet to facilitate servicing and general maintenance.

Raising the heat pump off the floor a few inches is generally a good practice since this will prevent rusting of the bottom panel of the unit. We recommend that the heat pump be placed on a piece of 2" Styrofoam covered with 1/4" plywood. The Styrofoam will smooth out any irregularities in the cement floor while the plywood will distribute the weight of the NORDIC® unit evenly over the Styrofoam. This process will also deaden the compressor noise emitted from the bottom of the cabinet.

ELECTRICAL PROVISIONS

The heat pump has a concentric 1.093” / 0.875” knockout for power supply connection to the electrical box. There are also two other 0.875” knockouts: one for connections to the indoor circulator; the other for connections to the circulator pump module for ground loop applications. There are three 1/2” openings with plastic grommets (grommet hole is 3/8”) in the upper section of the electrical box for connections to the controls.

A schematic diagram and electrical box layout diagram can be found inside the electrical box cover for quick reference on the connections required. The electrical box diagram also contains information about the size of wire for the connections, as well as the recommended breaker size.

A properly qualified electrician should be retained to make the connections to the heat pump and associated controls. The connections to the heat pump **MUST** conform to local codes.

CIRCULATOR PUMP MODULE WIRING

The heat pump has provisions for connecting the circulator pump module so that the pumps will be turned on whenever the compressor operates. Connect the circulator pump module to the appropriate two terminals of the terminal strip marked **OUTDOOR CIRCULATORS** in the heat pump, as per the voltage of the circulator pump module. Ensure that the total current draw of all circulators connected to the terminal strip does not exceed the value indicated on the label in the heat pump electrical box. Refer to the electrical box drawing on the electrical box cover for more information.

CONTROL REQUIREMENTS

The heat pump comes equipped with Lonworks controller and LCD display. All stage setpoints as well as other data can be obtained and adjusted using the display. The heating stages are S1 = Stage 1 compressor, S2 = Stage 2 compressor, and S3 = auxiliary heat. The cooling stages are S1 = Stage 1 compressor and S2 = Stage 2 compressor. The EMWT unit operation is self sufficient, the only control signals required are to turn on the Heating and Cooling Zone Circulator(s) located inside the unit.

The electrical box diagram on the electrical box cover provides a description of the signal connections in the heat pump. They are also listed in **TABLE 1** below.

TABLE 1 - Control Signal Descriptions	
Signal	**Description**
C	**24VAC Common (Ground)**
R	**24VAC Hot**
HZ	**Heating Zone Circulator**
CZ	**Cooling Zone Circulator**

The Heating zone circulator is activated by connecting R and HZ together via dry contacts. The Cooling Zone circulator is activated by connecting R and CZ together via dry contacts. Dry contacts are used for all heat pump connections to ensure that the heat pump control signals remain isolated from the rest of the system.

Drawing 000665CDG depicts a typical wiring diagram. This drawings represent a basic system. It is recommended that the system be designed by a qualified system designer to ensure proper functionality. The EMWT-HSCW unit does not have a “dedicated” heating or cooling mode. It fulfills both functions anytime the compressor is operational.

TABLE 2 shows typical settings for the heating and cooling stages. With these settings, Stage 1 will activate when the tank temperature reaches the activation point. If the load is too great, the heating tank temperature will continue to drop when heating (or the cooling tank will continue to rise when cooling) until Stage 2 is activated. If the load is still too great , Stage 3 will activate, As the heating tank temperature stops dropping and begins to increase, or the cooling tank stops rising and begins to decrease) , Stage 3 will turn off before Stage 2 and Stage 2 will turn off before Stage 1, There are three main advantages to this:

- Less probe lag leading to reduced overshoot as the tank temperature rate of change is reduced when only Stage 1 compressor is active.
- Prolonged Stage 1 compressor runtime leads to increased overall efficiency as Stage 1 has a higher COP than Stage 2.
- Reduced number of compressor starts.

The settings may be changed as desired; however Stage 1 setpoint for heating cannot not exceed **108°F (42°C)**; Stage 1 cooling setpoint cannot be set below **40°F (4.5°C).** The controller will limit the setpoints to these values if out of range values are entered. These limit values prevent the refrigerant pressures from approaching the safety control settings, possibly causing nuisance shut downs. The controller settings can only be entered in Fahrenheit , Celsius values are for reference only

TABLE 2 - Typical Control Settings

HEATING						
	Stage 1		**Stage 2**		**Stage 3**	
Item	**°F**	**°C**	**°F**	**°C**	**°F**	**°C**
Setpoint	**108**	**42.2**	**100**	**37.8**	**90**	**32.2**
Delta	**8**	**4.4**	**10**	**5.6**	**20**	**11.1**
Activation *	**100**	**37.8**	**90**	**32.2**	**70**	**21.1**
COOLING						
	Stage 1		**Stage 2**			
Item	**°F**	**°C**	**°F**	**°C**		
Setpoint	**45**	**7.2**	**50**	**10**		
Delta	**8**	**4.4**	**10**	**5.6**		
Activation *	**53**	**11.6**	**60**	**15.6**		
*Activation is indirectly set by the Setpoint and Delta values						

If only floor zones are being heated, it is highly recommended to drop each of the heating setpoints by 15°F (8°C) for increased efficiency.

SAFETY CONTROLS

The heat pump has three built in safety controls which are designed to protect the unit from situations which could damage it should the operation of the refrigeration circuit fall outside the allowable operating range.

A. Low Pressure Control

The low pressure control monitors the compressor suction pressure and will shut the compressor down if the refrigerant evaporating pressure becomes too low, risking the danger of freezing conditions in the evaporator.

B. High Pressure Control

The high pressure safety control monitors the compressor discharge pressure and will shut the compressor down if the condensing pressure becomes too high.

C. Manual High Pressure Control

The manual high pressure safety control is wired in directly into the compressor contactor signal and will shut the compressor down should there be a failure in the control system.

The controller continuously monitors the high and low pressure safety controls (A and B). Should one of them trip, the compressor will shut down and a lockout counter will be incremented. After a 10 minute period, a re-start will be attempted. If the unit runs for an hour without another trip, the lockout counter will be reduced. The system will allow up to three safety lockouts within an hour, after which the lockout will become permanent and the compressor cannot be started again until the unit is powered down, or the **RESET** button in the electrical box is pressed.

Before resetting the unit, check the **SERVICE1** display screen to determine which safety control tripped.

If the controller enters permanent lockout mode there is a serious problem with the system and it must be rectified if the unit is to maintain good service.

NOTE: If the the heat pump is permanently locking out on the LOW pressure control, repeated resetting of the unit could cause the heat exchanger to freeze and rupture, destroying the heat pump and voiding the warranty.

INDICATOR LIGHTS

The EMWT-Series unit has three indicator lights on the side of the electrical box. They are described in **TABLE 3.**

TABLE 3 - Indicator Lights

Colour	**Indicates**
Green	**Compressor ON**
Yellow	**Electric Elements ON**
Red	**Trouble (Locked out)**

LOOP TERMINOLOGY

The following terms are used to describe the various "loops" of the EMWT heat pump system:

- Outdoor Loop— Connections for the ground loop exchanger .
- Heating Zone Loop—Connections for building heating zone loop. The Heating Zone Circulator provides flow for this loop.
- Cooling Zone Loop—Connections for building cooling zone loop. The Cooling Zone Circulator provides flow for this loop.
- Hot Indoor Loop—Hot water loop between the condenser and the Hot buffer tank (inside the unit).
- Cold Indoor Loop—Cold water loop between the evaporator and the Cold buffer tank (inside the unit).
- DHW Loop—Connections for the Domestic Hot Water.

INTERNAL HYDRONIC COMPONENTS

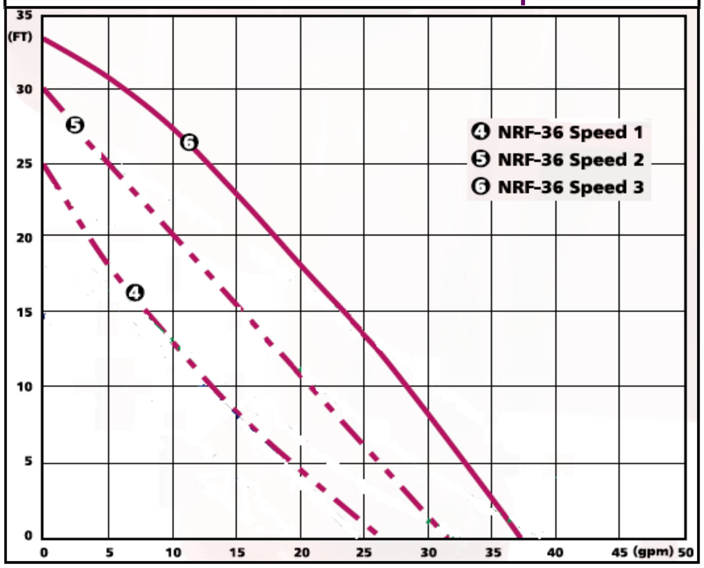
The EMWT-Series unit has virtually everything required for a hydronic installation built into it, including the following:

- 50 USGAL (189L) Hot buffer tank with electric backup
- 50 USGAL (189L) Cold buffer tank
- Pre-charged expansion tank
- 75PSIG pressure relief valve
- Heating Zone Circulator (B&G NRF-36) with isolation valves
- Cooling Zone Circulator (B&G NRF-36) with isolation valves
- Pressure gauges
- Shutoff valves and boiler valves for purging

Refer to **Diagram B** for the locations of the components.

The pump curve for the Heating and Cooling zone circulators is shown in **Diagram A.**

DIAGRAM A - B&G NRF-36 Pump Curve



ELECTRIC HEAT

The Hot Tank contains electric elements for the purpose of auxiliary / backup heat. The control for the electric heat comes from the Heating Stage 3 setpoint and delta T values (see **TABLE 2**).

The unit is shipped with the electric heat breaker in the off position. **IT IS VERY IMPORTANT THAT THE SYSTEM IS FLOODED AND PRESSURIZED BEFORE TURNING ON THE ELECTRIC HEAT BREAKER.** An electric element that is not under water will burn out in a matter of seconds.

There is a safety pressure switch mounted to the side of the Hot Tank, **the electric heat contactor will not engage unless the system pressure is above 10PSIG.** Should the heat pump require service, the compressor breaker should be turned off. This prevents the refrigeration section from operating but allows the electric heat to continue operating.

HEATING ZONE CONNECTIONS

The Heating Zone ports are 1" FPT brass fittings (refer to **CASE DETAILS** on page 35). The heating zone header pipes can be connected to these ports. The Heating Zone Circulator is activated by connecting R and HZ together via dry contacts.

COOLING ZONE CONNECTIONS

The Cooling Zone ports are 1" FPT brass fittings (refer to **CASE DETAILS** on page 35). The cooling zone header pipes can be connected to these ports. The Cooling Zone Circulator is activated by connecting R and CZ together via dry contacts.

PURGING THE UNIT

There are ball valves and boiler drains inside the unit to facilitate filling and purging. Refer to **DIAGRAM B** and drawing **000346RCD** for component locations. Once the system has been filled with the desired fluid, purging of the internal loops may be done in the following manner:

The Hot Indoor Loop (condenser) and Hot Zone Loop can be purged in the following manner:

1. Connect the fill hose to the Hot Indoor Boiler Drain.
2. Connect the drain hose to the Hot Zone Boiler Drain.
3. Close the Hot Indoor Ball Valve.
4. Close the Hot Zone OUT Ball Valve.
5. Open the Hot Zone Boiler Drain and drain hose valve.
6. Open the Hot Indoor Boiler Drain and fill hose valve.
7. Purge until air can no longer be heard leaving the drain.
8. Close the Hot Zone Ball Valve.
9. Open the Hot Indoor Ball Valve.
10. Purge until air can no longer be heard leaving the drain.
11. Close the Hot Indoor Ball Valve.
12. Close the Hot Zone Ball Valve.
13. Open the Hot Zone OUT Ball Valve.
14. Purge until air can no longer be heard leaving the drain.

The Cold Indoor Loop (evaporator) and Cold Zone Loop can be purged in the following manner:

1. Connect the fill hose to Cold Indoor Boiler Drain.
2. Connect the drain hose to the Cold Zone Boiler Drain.
3. Close the Cold Zone IN Ball Valve.
4. Close the top isolation valve of the Cold Indoor Circulator.
5. Open the Hot Zone Boiler Drain and drain hose valve.
6. Open the Hot Indoor Boiler Drain and fill hose valve.
7. Purge until air can no longer be heard leaving the drain.
8. Close the Cold Zone Ball Valve.
9. Open the top isolation valve of the Cold Indoor Circulator.
10. Purge until air can no longer be heard leaving the drain.
11. Close the top isolation valve of the Cold Indoor Circulator.
12. Close the Cold Zone Ball Valve.
13. Open the Cold Zone IN Ball Valve.
14. Purge until air can no longer be heard leaving the drain.

Each of the procedures above may need to be performed several times as purging of the entire system is performed to ensure that all of the air has been removed.

DOMESTIC HOT WATER CONNECTIONS

A typical piping diagram for a two tank (pre-heat tank) configurations can be found in **drawing 000970PDG at the end of this section**. Be sure to note the position of the check valve and the direction of water flow. Other configurations are possible, and there may be multiple units tied together in larger buildings.

CAUTION: Use only copper pipe to connect the desuperheater. Should the DHW thermostat fail, the water temperature could rise to as high as 200°F (93°C).

Ensure the tank is filled with water and under pressure before activating the heat pump. Slightly loosen the boiler drain on the DHW Out pipe to allow air to escape from the system before the unit is started. This step will make certain that the domestic hot water circulator in the unit is flooded with water when it is started.

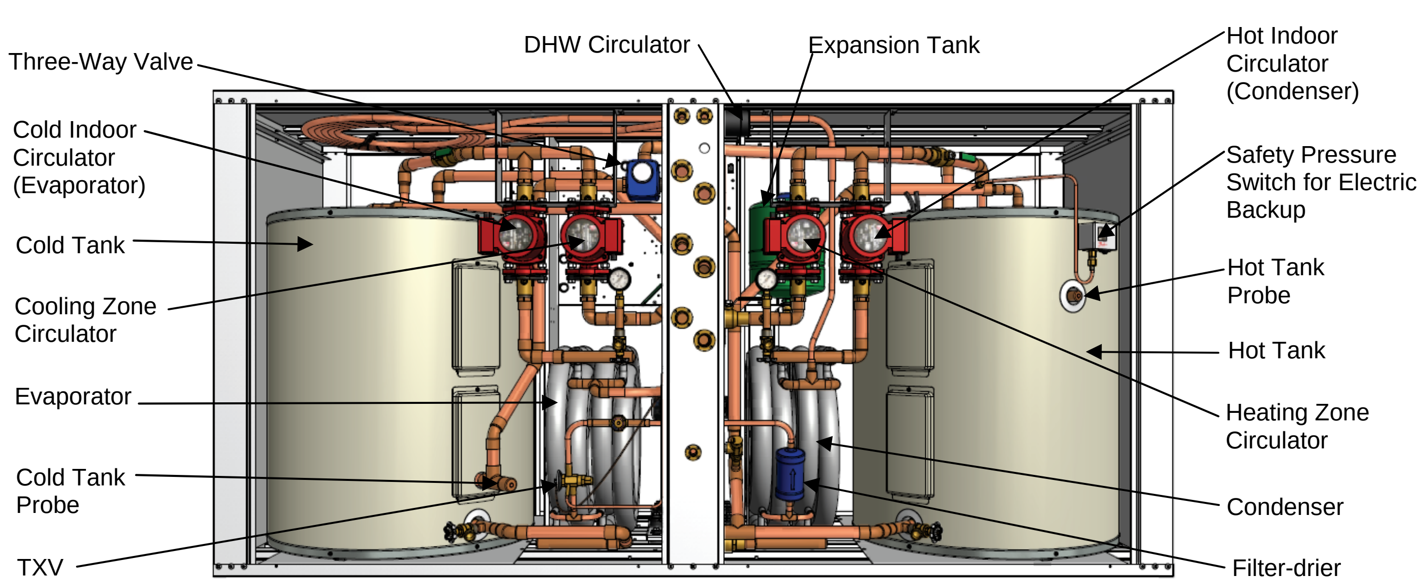
CAUTION: the domestic hot water pump is water lubricated; damage will occur to the pump if it is run dry for even a short period of time.

The DHW loop may have to be purged of air several times before good circulation is obtained. A temperature difference between the DHW In and DHW Out can be felt by hand when the circulator pump is operating properly.

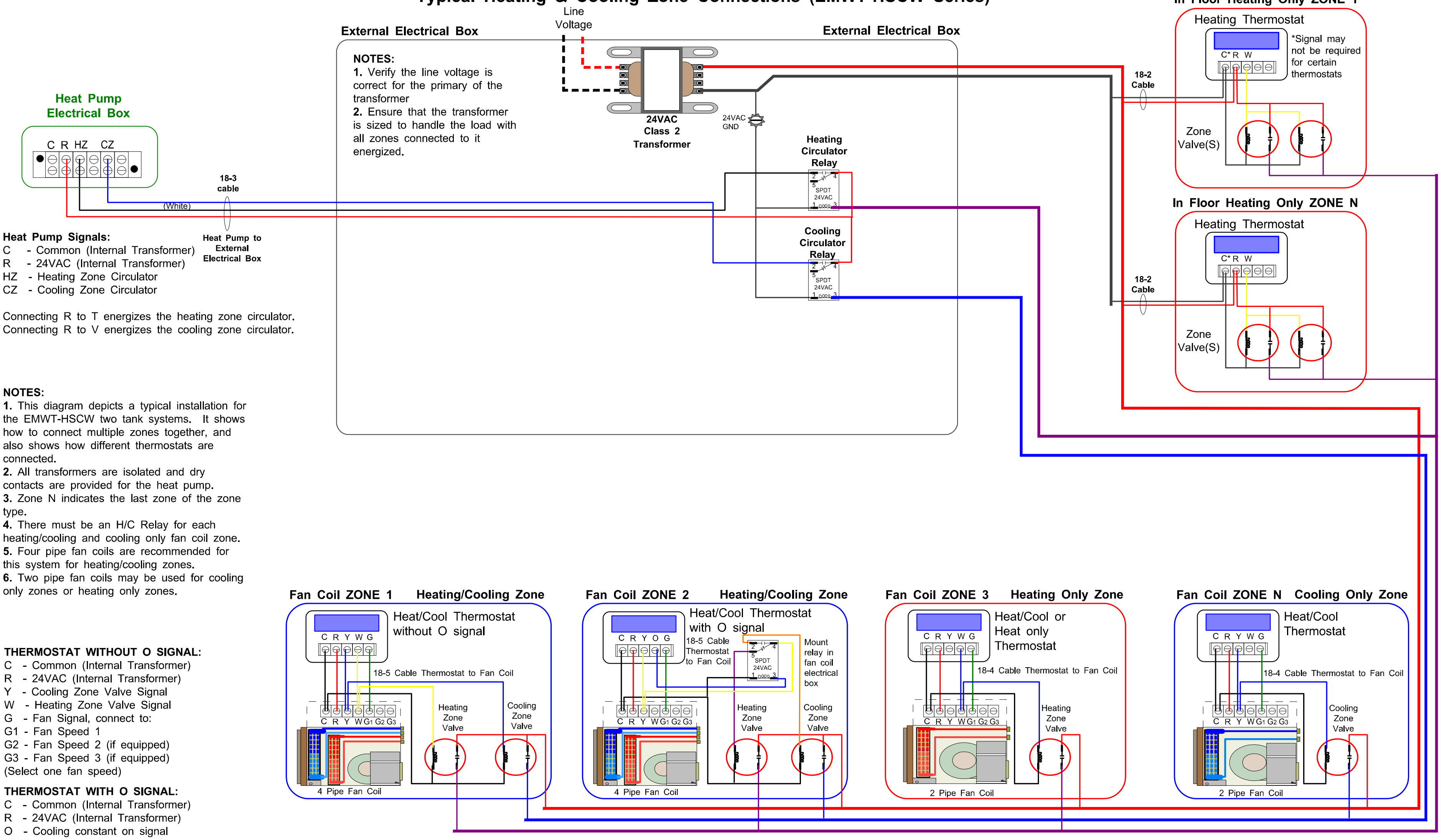
For the pre-heat tank setup, the final tank should be set to **140°F(60°C).** The pre-heat tank does not require electric elements. This setup takes full advantage of the desuperheater as it is the sole heat provider to the pre-heat tank. The desuperheater remains active during the compressor runtime until the pre-heat tank has been completely heated by the desuperheater alone. This setup is more energy efficient than a single tank setup.

CAUTION: If two (2) shut-off valves are located on the domestic hot water ines as shown in the diagram, a pressure relief valve must be installed to prevent possible damage to the domestic hot water circulator pump should both valves be closed.

DIAGRAM B - Circulator and Major Component Locations



Typical Heating & Cooling Zone Connections (EMWT-HSCW Series)



NOTES:
1. Verify the line voltage is correct for the primary of the transformer
2. Ensure that the transformer is sized to handle the load with all zones connected to it energized.

Heat Pump Signals:
C - Common (Internal Transformer)
R - 24VAC (Internal Transformer)
HZ - Heating Zone Circulator
CZ - Cooling Zone Circulator

Connecting R to T energizes the heating zone circulator.
Connecting R to V energizes the cooling zone circulator.

NOTES:
1. This diagram depicts a typical installation for the EMWT-HSCW two tank systems. It shows how to connect multiple zones together, and also shows how different thermostats are connected.
2. All transformers are isolated and dry contacts are provided for the heat pump.
3. Zone N indicates the last zone of the zone type.
4. There must be an H/C Relay for each heating/cooling and cooling only fan coil zone.
5. Four pipe fan coils are recommended for this system for heating/cooling zones.
6. Two pipe fan coils may be used for cooling only zones or heating only zones.

THERMOSTAT WITHOUT O SIGNAL:
C - Common (Internal Transformer)
R - 24VAC (Internal Transformer)
Y - Cooling Zone Valve Signal
W - Heating Zone Valve Signal
G - Fan Signal, connect to:
G1 - Fan Speed 1
G2 - Fan Speed 2 (if equipped)
G3 - Fan Speed 3 (if equipped)
(Select one fan speed)

THERMOSTAT WITH O SIGNAL:
C - Common (Internal Transformer)
R - 24VAC (Internal Transformer)
O - Cooling constant on signal
Y - Zone Valve Signal
G - Fan Signal, connect to:
G1 - Fan Speed 1
G2 - Fan Speed 2 (if equipped)
G3 - Fan Speed 3 (if equipped)
(Select one fan speed)

REV	ECO #	IMPL BY	APVD BY	DATE
02	000191	C. GEDDES	C. GEDDES	01 MAR 12
01	Initial Release	C. GEDDES	C. GEDDES	25 MAR 08

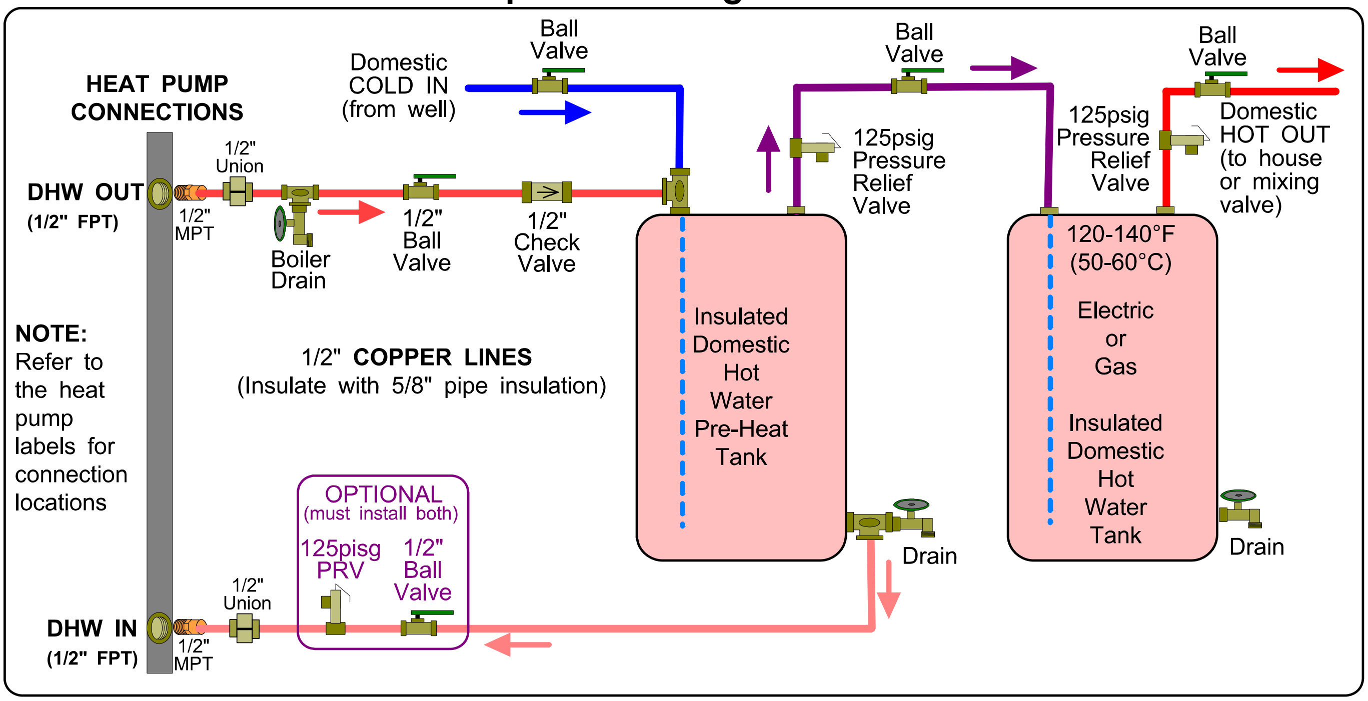
Drawn By: Chris Geddes	Date: 25 MAR 08
Checked By: Chris Geddes	Date: 25 MAR 08
Approved By (ENG): Chris Geddes	Date: 25 MAR 08
Approved By (MFG)	Date
Approved By	Date

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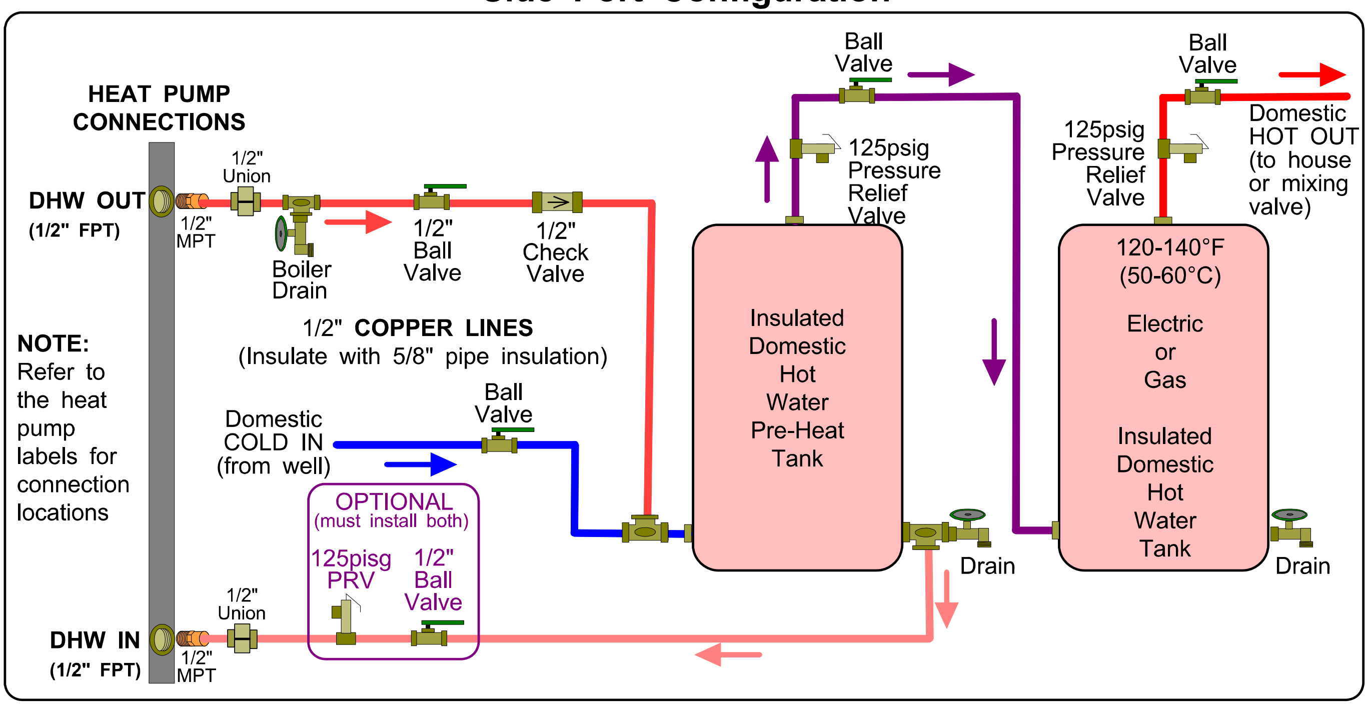
Drawing Name		
Typical Heating & Cooling Zone Wiring (EMWT-HSCW Series)		
Size: B	Drawing Number: 000665CDG	REV: 02	SHEET: 1 of 1

Single Unit Connection to Domestic Hot Water Pre-Heat Tank (Brass FPT)

Top Port Configuration



Side Port Configuration



					Drawn By Chris Geddes	Date 10 MAR 09	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4
					Checked By Chris Geddes	Date 10 MAR 09	Drawing Name: Single Unit Connection to DHW Pre-Heat Tank (Brass FPT)
					Approved By (ENG) Chris Geddes	Date 10 MAR 09	
01	Initial Release	C. GEDDES	C. GEDDES	10 MAR 09	Approved By (MFG)	Date	Size: A; Drawing Number: 000970PDG; REV: 01; SHEET: 1 of 1
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	

CONTROLLER INPUTS/OUTPUTS

The controller has several inputs and outputs that it uses to monitor and control the operation of the heat pump. They are listed in **TABLE 4**.

The status of the inputs and outputs can be seen via the various display screens of the LCD display. They are described in the **DISPLAY SCREENS** section. The controller outputs also have LED's to indicate their status.

TABLE 4 - Controller Inputs / Outputs

I/O Type	Number	Indicates
Input	**1**	**Heating Tank Temperature**
Input	**2**	**Cooling Tank Temperature**
Input	**3**	**Low Pressure Control**
Input	**4**	**High Pressure Control**
Input	**5**	**Cooling Only Switch**
Input	**6**	**Reset Button**
Output	**1**	**Compressor LOW**
Output	**2**	**Compressor HIGH**
Output	**3**	**Electric Heat**
Output	**4**	**Outdoor Loop to Hot Tank***
Output	**5**	**Outdoor Loop Circulator Pumps**
* Ground Loop is connected to the heating tank when active		

COOLING ONLY SWITCH

The Cooling Only switch is located on the side of the electrical box above the status lights. It can be used to increase the efficiency of the unit during periods when no heating is required. It effectively disables the heating capability of the unit by ignoring the heating signals when the switch is in the ON position. This allows the heating tank to "float" at the ground loop temperature instead of being maintained at the heating setpoint temperature. This reduces the discharge pressure and improves efficiency accordingly. Whenever there is a cooling call and the compressor is activated, the outdoor circulator pumps will be activated immediately and ground loop flow will pass through the heating tank.

NOTE: THE COOLING ONLY SWITCH MUST BE IN THE OFF POSITION TO ENABLE HEATING OUTPUT.

PARAMETER RANGES

TABLE 5 and **TABLE 6** depict the allowable setting ranges for the Hot and Cold tanks. The bold values are user adjustable. The remaining values are fixed or calculated by the controller.

The Hot and Cold Loop parameters are what prevent the Hot Tank from becoming too hot and the Cold Tank from becoming too cold. When there is a load on one tank and little to no load on the other, the little to no load tank will reach the Loop Activation temperature. When this occurs, the tank valves will be adjusted to connect this tank to the Outdoor Loop and the outdoor pump module will turn on. Ground loop fluid will circulate through the tank until the temperature is brought back to the Loop Setpoint value or until the compressor shuts off due to the other tank being satisfied.

TABLE 5 - HOT TANK SETTING RANGES

Parameter	Default	Allowable Range (°F)	
	(°F)	MIN	MAX
Hot Loop Activation	114	96 (S1+6)	114 (S1+6)
Hot Loop Setpoint	111	93 (S1+3)	111 (S1+3)
Stage 1 Setpoint	**108**	90	108
Stage 1 Delta	**8**	2	10
Stage 1 Activation	100	80	106
Stage 2 Setpoint	**100**	85	106 (S1-2)
Stage 2 Delta	**10**	2	15
Stage 2 Activation	90	70	104
Stage 3 Setpoint	**90**	70	100 (S1-8)
Stage 3 Delta	**20**	2	30
Stage 3 Activation	70	40	98
S1 = Stage 1 Setpoint			

TABLE 6 - COLD TANK SETTING RANGES

Parameter	Default	Allowable Range (°F)	
	(°F)	MIN	MAX
Stage 2 Setpoint	**45**	40	55
Stage 2 Delta	**8**	2	15
Stage 2 Activation	53	42	70
Stage 2 Setpoint	**50**	45	60
Stage 2 Delta	**10**	2	15
Stage 2 Activation	60	47	75
Cold Loop Setpoint	44	39 (S1-1)	49 (S1-1)
Cold Loop Activation	40	35 (S1-5)	45 (S1-5)
S1 = Stage 1 Setpoint			

DISPLAY SCREENS

The display has six buttons at the bottom of it. They are, from left to right: EXIT, LEFT, UP, DOWN, RIGHT, ENTER. These buttons are used to select screens and to select and modify values. Any parameters that have a **W** at the bottom left of their section of the display may be modified.

To adjust a setpoint, select the setpoint and press ENTER. Set the least significant digit (furthest right) and then press the LEFT button to select the next digit. Press ENTER to store the value once it has been set. Note that there is a range that the parameters can be set to. If a value outside the range is entered, the actual value for the parameter will be that denoted by the **Limited To value**.

When the unit is powered up the display will show the Distech Controls default screen. Press the ENTER button twice to see the list of available displays. Displays is the only selection from the startup screen that is used. The main display for this system is the EMWT Display screen. Select it from the list and press ENTER to view it. **TABLES 7-16** describe each of the display screens.

TABLE 7 - EMWT Display		
Parameter	**Units**	**Description**
Hot Tank Temp	°F	Hot Tank Temperature
Cold Tank Temp	°F	Cold Tank Temperature
Three-Way to Hot	Flag	0 = No, 1 = Yes
Outdoor Pump	Flag	0 = Off, 1 = On
Lockout?	Flag	0 = No, 1 = Yes

TABLE 8 - SET HEAT STG1		
Parameter	**Units**	**Description**
Heat S1 Setpoint	°F	Setpoint entered by user
Limited to	°F	Setpoint accepted by system
Heat S1 Delta	°F	Delta entered by user
Limited to	°F	Delta accepted by system

TABLE 9 - SET HEAT STG2		
Parameter	**Units**	**Description**
Heat S2 Setpoint	°F	Setpoint entered by user
Limited to	°F	Setpoint accepted by system
Heat S2 Delta	°F	Delta entered by user
Limited to	°F	Delta accepted by system

TABLE 10 - SET HEAT STG3		
Parameter	**Units**	**Description**
Heat S3 Setpoint*	°F	Setpoint entered by user
Limited to	°F	Setpoint accepted by system
Heat S3 Delta	°F	Delta entered by user
Limited to	°F	Delta accepted by system

* System must be pressurized to a minimum of 12PSIG for Stage 3 to activate.

TABLE 11 - SET COOL STG1		
Parameter	**Units**	**Description**
Cool S1 Setpoint	°F	Setpoint entered by user
Limited to	°F	Setpoint accepted by system
Cool S1 Delta	°F	Delta entered by user
Limited to	°F	Delta accepted by system

TABLE 12 - SET COOL STG2		
Parameter	**Units**	**Description**
Cool S2 Setpoint	°F	Setpoint entered by user
Limited to	°F	Setpoint accepted by system
Cool S2 Delta	°F	Delta entered by user
Limited to	°F	Delta accepted by system

TABLE 13 - SERVICE 1		
Parameter	**Units**	**Description**
Hi Pres Lockout	Flag	0 = clear, 1 = fault
Lo Pres Lockout	Flag	0 = clear, 1 = fault
Lock Count	Num	Number of lockouts
Permanent Lock	Flag	0 = not locked, 1 = locked

TABLE 14 - SERVICE 2		
Parameter	**Units**	**Description**
Cooling Only	Flag	0 = Off, 1 = On
Passive Kill	Flag	0 = passive cooling enabled, 1 = passive cooling disabled
Passive Timer	Num	Minutes of timer (max 60)
Compressor Lo	Flag	0 = Off, 1 = On
Compressor Hi	Flag	0 = Off, 1 = On

TABLE 15 - HEAT DISPLAY		
Parameter	**Units**	**Description**
Hot Tank Temp	°F	Hot tank temperature
Stage 1	Flag	0 = Off, 1 = On
Stage 2	Flag	0 = Off, 1 = On
Stage 3	Flag	0 = Off, 1 = On
Hot Valve Temp	°F	3-Way activation temperature

TABLE 16 - COOL DISPLAY		
Parameter	**Units**	**Description**
Cold Tank Temp	°F	Cold tank temperature
Stage 1	Flag	0 = Off, 1 = On
Stage 2	Flag	0 = Off, 1 = On
Cold Valve Temp	°F	3-Way activation temperature

SYSTEM DESCRIPTION

The EMWT-HSCW heat pump operation differs from traditional heat pump operation in that there is no dedicated heating or cooling mode. Instead, the heat pump operates solely in the “heating mode”, there is no reversing valve required to obtain cooling. Traditional heat pump setups use only one side of the refrigeration process at a time. The other side of the process is in a sense wasted as it is connected directly to the ground loop. In other words, the heat pump can only transfer heat from the ground loop to a heating zone, or vice versa when operating in cooling mode.

The EMWT-HSCW unit adds another dimension to the equation, it takes advantage of both sides of the refrigeration process. What this means is that it can not only transfer heat between the ground loop and a heating load (or cooling load), it can transfer heat directly from a cooling load to a heating load, virtually doubling the coefficient of performance (COP) of the unit. Another added benefit of this type of system is reduced load on the ground loop as it is not used when the tanks are within their allowable temperature range. This provides increased recovery time for the ground loop which leads to better entering liquid temperatures.

Both sides of the refrigeration process can be used because there is a buffer tank on each side of the refrigeration process. The Hot Tank is on the condenser side and the Cold Tank is on the evaporator side. When in operation, heat is extracted from the Cold Tank and transferred to the Hot Tank. The Hot Tank has an upper limit and the Cold Tank has a lower limit. When the limit is exceeded, ground loop fluid is directed to the tank via a pair of two-way valves. The outdoor pump module is activated and the ground loop fluid circulates through the tank until the tank temperature is brought back into range, at which point the outdoor loop pump module is shut off. This process will repeat as necessary until the tanks are satisfied and the compressor is shut down.

COMPRESSOR OPERATION

The compressor operates based on the combination of the calls for heating and cooling. They are “OR” ed together as shown in **TABLE 17**. Impossible combinations have been removed from the table for simplicity.

OPERATION SCENARIOS

There are three different operating scenarios for this unit: heating load only, cooling load only, and simultaneous heating and cooling loads. Each of these scenarios is explained in the following sections.

HEATING LOAD ONLY

As described previously, this unit has three heating stages: Stage 1 = Stage 1 compressor (part load), Stage 2 = Stage 2 compressor (full load), and Stage 3 = heating tank electric elements.

In the heating load only scenario the Hot Tank will see a temperature drop due to the heating load. When the Hot Tank reaches the heating Stage 1 activation temperature, the compressor will start (part load mode) and the Hot Indoor and Cold Indoor circulators will be turned on to circulate fluid between the heat exchangers and the tanks.

TABLE 17 - Compressor Truth Table

Heating		Cooling		Compressor	
Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
0	0	0	0	0	0
0	0	1	0	1	0
0	0	1	1	1	1
0	1	1	0	1	1
0	1	1	1	1	1
1	0	0	0	1	0
1	0	0	1	1	1
1	0	1	0	1	0
1	0	1	1	1	1
1	1	0	0	1	1
1	1	0	1	1	1
1	1	1	0	1	1
1	1	1	1	1	1

If the heating load is large enough, the Hot Tank will continue to drop in temperature. When the heating Stage 2 activation temperature is reached, the compressor solenoid will be energized to operate the compressor in full load mode.

If the heating load is still too large, the Hot Tank will once again continue to drop in temperature. When the heating Stage 3 activation temperature is reached, the electric elements will be brought on.

As the heating load becomes satisfied, the Hot Tank will begin to rise in temperature. Each heating stage will shut off at its setpoint value and the Hot Tank will be satisfied.

While the compressor is running in either part load or full load mode, the Cold Tank will be chilled as heat is extracted from it and transferred to the Hot Tank. When the Cold Tank reaches the Cold Indoor Loop activation temperature, the pair of two-way valves will be switched to the Cold Tank and the outdoor loop pump module will be brought on to circulate ground loop fluid through the Cold Tank. The outdoor loop pump module will remain on until the Cold Tank has been brought back up to the Cold Indoor Loop setpoint value.

COOLING LOAD ONLY

As described previously, this unit has two cooling stages: Stage 1 = Stage 1 compressor (part load), and Stage 2 = Stage 2 compressor (full load).

In the cooling load only scenario, the Cold Tank will see a temperature rise the due to the cooling load. When the Cold Tank reaches the Stage 1activation temperature the compressor will start (part load mode), the Hot Indoor and Cold Indoor circulators will be turned on to circulate fluid between the heat exchangers.

If the cooling load is still too large, the Cold Tank will once again continue to rise in temperature. When the cooling Stage 2 activation temperature is reached, the compressor solenoid will be energized to operate the compressor in full load mode.

As the cooling load becomes satisfied, the Cold Tank will begin to drop in temperature. Each cooling stage will shut off at its setpoint value and the Cold Tank will be satisfied.

While the compressor running in either part load or full load mode, the Hot Tank will be heated as heat is extracted from the Cold Tank and transferred to it. When the Hot Tank reaches the Hot Indoor Loop activation temperature, the pair of two-way valves will be switched to the Hot Tank and the outdoor loop pump module will be brought on to circulate ground loop fluid through the Hot Tank. The outdoor loop pump module will remain on until the Hot Tank has been brought back down to the Hot Indoor Loop setpoint value.

SIMULTANEOUS HEATING AND COOLING LOADS

In this scenario, the system will essentially be balanced, with the exception that the Hot Tank will receive extra heat from the energy consumed by the compressor. Assuming that both tanks are satisfied at the start of the scenario, either tank could start the compressor (part load mode), as well as the Hot and Cold Indoor circulators. Refer to the truth table of **TABLE 17**. If the loads are large enough, the compressor will continue to run in part load mode until one of the tanks reaches its compressor full load activation point (Stage 1). The compressor will continue to operate until both tanks have been satisfied. The three-way valve and outdoor loop pump module will operate as required should the tanks reach their temperature limit.

Sizing and Hydronic Information

HEAT PUMP SIZING

TABLE 18 depicts a rough guideline as to the size of home each heat pump size can handle for **ground loop** installations.

TABLE 18 - Heat Pump Size vs. Heated Area for a Ground Loop System

Model	Size (tons)	Sq.ft.	Sq.m.
65	5	2,600	240
75	6	3,100	290

THE TABLE ABOVE IS FOR INFORMATION ONLY, IT SHOULD NOT BE USED TO SELECT A UNIT SIZE. It simply shows on average what size unit is required for a typical two-level home (main level and below grade basement) with R-20 walls, R-40 ceiling and average size and number of windows. The Heated Area is the area of the main level, The table accounts for a basement the same size as the heated area.

MARITME GEOTHERMAL LTD. HIGHLY RECOMMENDS THAT A PROPER HEAT LOSS/GAIN ANALYSIS BE PERFORMEDE BY A PROFESSIONAL INSTALLER WITH CSA APPROVED SOFTWARE BEFORE SELECTING THE SIZE OF UNIT REQUIRED FOR THE APPLICATION. For heating dominant areas, we recommend sizing the unit to 100% of the heating design load for maximum long term efficiency with minimal supplementary heat. The unit should be installed as per CSA 448.2-02. For ground loop applications, the ground exchanger should be designed using suitable software with a multi-year analysis.

There are many factors to consider when sizing the heat pump. Some of these factors include the number of levels, the size of the windows, the orientation of the home, attached garage, bonus rooms, walk-in basement, coldest outdoor temperature, etc. The heat loss program will take all of these factors into consideration in its calculations. An undersized installation will require not be as efficient and will required expensive auxiliary heat to maintain a comfortable temperature in the home, and the cost savings of having a geothermal heat pump are greatly reduced.

Once the total heat loss has been calculated, the unit can be sized using the performance tables (from the specifications document) in conjunction with the minimum expected entering liquid temperature of the ground loop (well water temperature for ground water system). The heat pump output must be able to match the total heat loss at the selected entering water temperature in order to provide a comfortable environment with minimal auxiliary heat.

HYDRONIC SYSTEMS - GENERAL

Hydronic systems typically provide heat through two different types of media:

- radiant in-floor heating
- forced air heating via fan coil units

One of the benefits of hydronic systems is the flexibility in setting up the heating system. Whereas a typical forced air system has one central thermostat controlling the entire heating system, the home may be sectioned into several areas called zones with a hydronic system. Each zone has its own thermostat, allowing simple separate temperature control of the individual areas in the home.

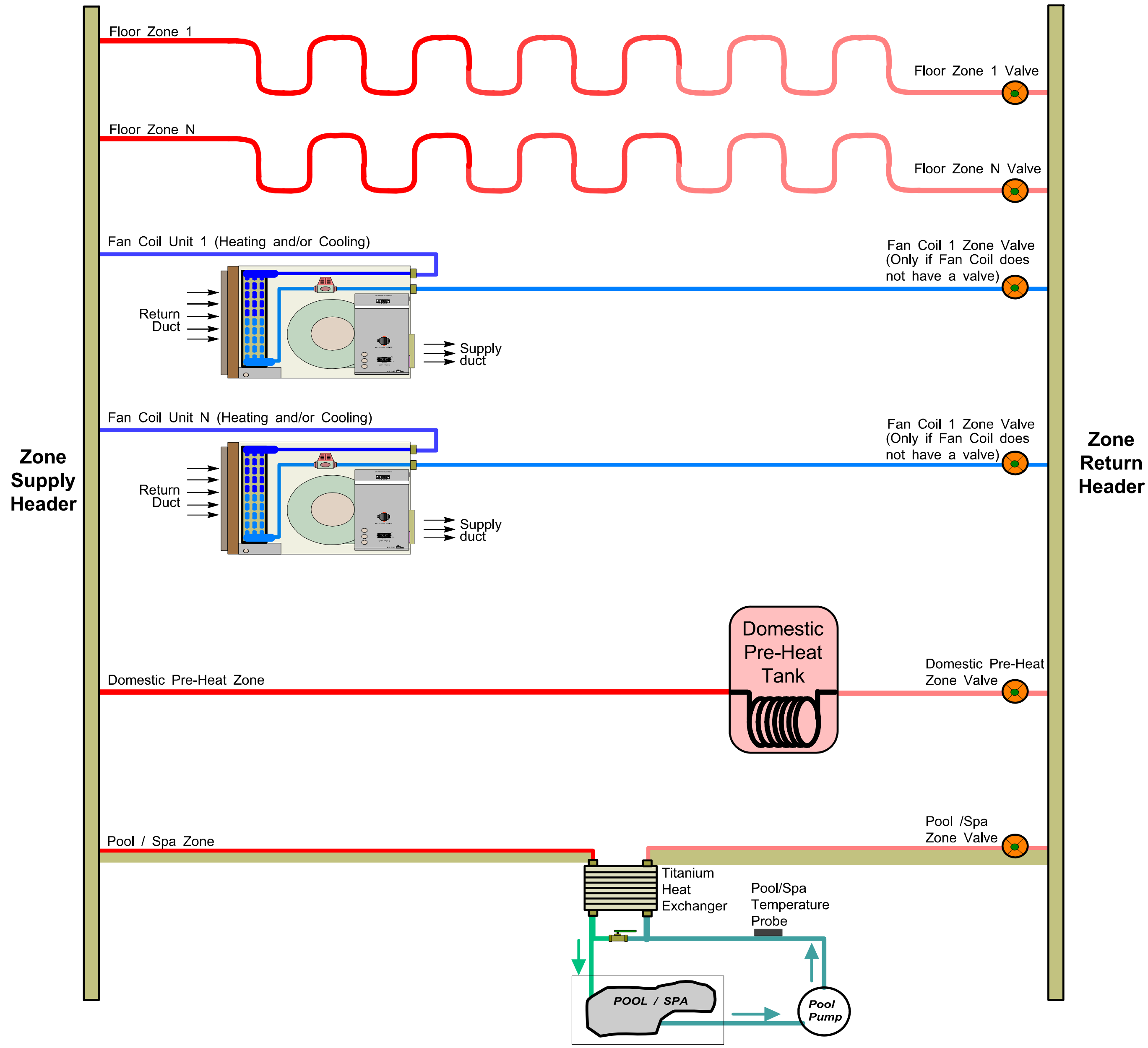
There are other uses for hydronic systems, the two most common being on-demand domestic hot water and pool/spa heating. **Drawing 000530PDG** shows the most common types of zones. A typical system consists of the heat pump, the buffer tank and the zones. For the EMW-Series, the buffer tank is part of the heat pump unit. The heat pump's sole purpose is to maintain the buffer tank set point. Its operation is independent of the zone operation.

Fan coils can be used to provide heating and/or cooling for areas that do not have radiant in-floor heating. They provide a means of air heating /cooling with minimal or no ductwork. Note that the buffer tank temperature should be set for **115°F (46°C)** if there are fan coils in the system.

Four port fan coils are recommended for connection to the system to keep separate piping for heating and cooling zones as there are individual hot and cold tanks in the unit.

It is recommended that all piping be insulated with 3/8" thick closed cell pipe insulation. This is a **MUST** for any piping that is used for cooling to prevent dripping onto floors and walls. Care should be taking when wiring the system to ensure that radiant in-floor heating zones are disabled whenever the heat pump is switched to cooling mode.

Typical Zone Types for Hydronic Applications



NOTES:

1. Floor zones are heating only. Cooling a floor zone will cause condensation in the floor. Floor zone valves should be wired through a relay that is controlled by the cooling signal (O) that breaks the signal when in cooling mode to ensure that they cannot accidentally be energized.
2. There may be multiple floor zones.
3. There may be multiple fan coil units, (heating and /or cooling). A zone valve is not required if the unit has a internal valve.
4. Domestic Pre-Heat Tank is for on-demand apllications. The tank must have a heat eaxchanger in it or an external one must be used to separate the zone loop from the potable water supply.
5. Ensure the floor circulator is adequately sized to accomodate the type and number of zones connected to the system.
6. The pool aquastat will operate the Pool/Spa Zone Valve.

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	06 SEP 07

Drawn By Chris Geddes	Date 06 SEP 07
Checked By Chris Geddes	Date 06 SEP 07
Approved By (ENG) Chris Geddes	Date 06 SEP 07
Approved By (MFG)	Date
Approved By	Date

170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: Typical Zone Types for Hydronic Applications

Size	Drawing Number	REV	SHEET
A	000530PDG	01	1 of 1

Ground Loop System Information

Once the ground loop has been pressure tested and the header pipes have been connected to the circulator pump module, the heat pump can be connected to the circulator pump module.

CIRCULATOR PUMP MODULE

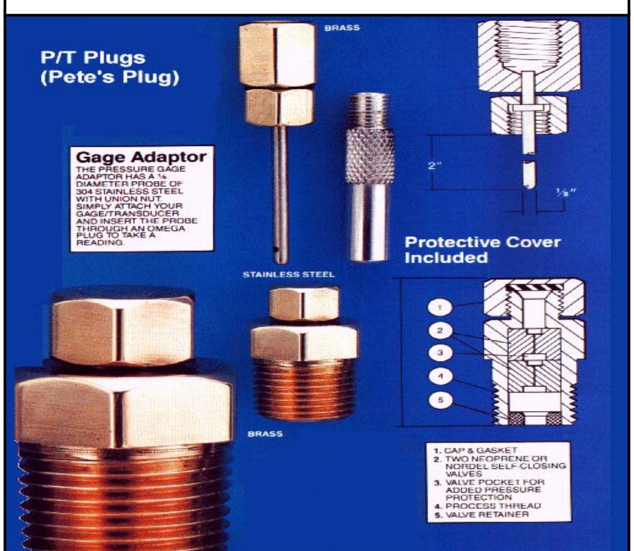
Maritime Geothermal Ltd. has compact pump modules with built in three way valves to facilitate filling and purging the ground loop. **Refer to drawing 000906CDG at the end of this section.** Alternatively, Grundfoss® Model UPS 26-99 or Taco® Model 0011 pumps or other brands with similar pumping capability may be used. The two pump module will typically handle 5 to 6 ton systems (model sizes 65, 75). This is based on a typical parallel system with one circuit per ton.

Maritime Geothermal recommends calculating the total pressure drop of the ground loop (including headers, indoor piping and heat pump exchanger drop) based on the antifreeze type and concentration at the desired minimum loop temperature. A pump module that can deliver the flow required for the unit at the calculated total pressure drop should be selected. **Refer to the Model Specific Information section** for unit flow requirements.

Loop pressure drops can be calculated using software such as those mentioned in the Horizontal Ground loops section, or can be calculated in a spreadsheet using the pipe manufacturer's pressure drop tables for pipe diameter and fittings.

The circulator pump module must be connected to the heat pump Outdoor Loop ports with a lineset suitable for the flow required with minimum pressure drop. 1" rubber or plastic lines should be used. The installation of P/T plugs (pressure / temperature, pronounced "*Pete's plugs*") is recommended on both the entering and leaving lines at the heat pump **(see Diagram C).**

DIAGRAM C - Typical P/T – "Pete's" Plug & Thermometer Stems



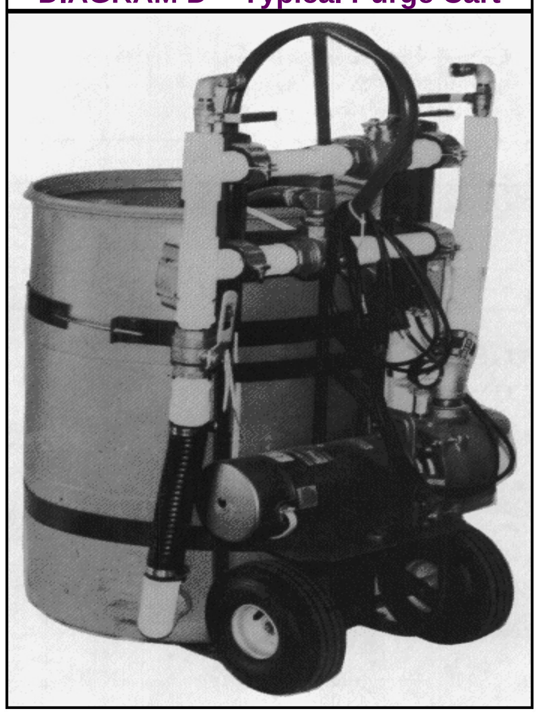
The P/T plug will allow the installer or homeowner to check water flow through the loop by measuring the pressure difference through the heat exchanger and comparing it to that listed in the **Model Specific Information section**, or the specifications document. Optional fittings with P/T ports are available for the circulator pump modules sold by Maritime Geothermal Ltd..

FLUSHING & PURGING THE GROUND LOOP

Once the groundloop has been installed and all connections are completed between the heat pump, circulator pump module and ground loop, the entire ground loop system should be **pressure tested with air to 100 PSIG** to make sure there are no leaks on any of the inside fittings. Soap all joints and observe that the pressure remains constant for 1 hour.

When satisfied that all connections are leak free, release the air pressure and connect a purge cart **(see Diagram D)** to the flushing access ports at the pump module **(refer to drawing 000906CDG)**. A temporary flushing system can alternately be constructed using a 45 gal. barrel and a pump with sufficient volume and head capability to circulate fluid at a **velocity of at least 2 ft./min.** through all parts of the loop.

DIAGRAM D - Typical Purge Cart



Adjust the circulator pump module valves to connect the purge cart to the ground loop. Begin pumping water through the ground loop, ensuring that the intake of the pump stays submerged at all times by continuously adding water. Water flowing back from the return line should be directed below the water level in the barrel or flush tank to prevent air being mixed with the outgoing water.

Once the lines have been filled and no more air bubbles are appearing in the line, adjust the circulator pump module valves to circulate water through the heat pump using the same technique as described above. When all air is removed reverse the flow of water through the lines by interchanging the flush cart lines and purge again. You will be able to visibly tell when all air is removed.

ADDING ANTIFREEZE SOLUTION

⚠ WARNING—RISK OF EXPLOSION ⚠

The Hot Tank is equipped with electric elements. Ensure the electric heat breaker is off while flushing, purging and adding antifreeze. The power should not be turned on until these three steps have been completed and the system has been pressurized to a minimum of 12PSIG. Maritime Geothermal Ltd. Shall not be responsible for damages, injury or death resulting in failure to follow these instructions. Units are shipped with the electric heat breaker in the off position and there is a safety switch which will not allow the element to turn on below 10PSIG.

In most mid and northern areas of the US and in all of Canada it is necessary to condition the loop fluid by the addition of some type of antifreeze solution so that it will not freeze during operation in the winter months. This antifreeze is required because the loop fluid will normally reach a low entering temperature of **28°F to 32°F (-2°C to 0°C)** and refrigerant temperatures inside the heat pump's heat exchanger may be as low as **20°F (11°C)** cooler. See **TABLE 19** for details of freeze protection provided by different concentrations.

TABLE 19 - Antifreeze Percentages by Volume				
Protection to:	**10°F**	**15°F**	**20°F**	**25°F**
Methanol	25%	21%	16%	10%
Propylene Glycol	38%	30%	22%	15%

NOTE: Add enough antifreeze to allow for a temperature 20°F lower than the expected lowest loop fluid temperature entering the heat pump.

Although many different antifreeze solutions have been employed in geothermal systems, the alcohols such as methanol or ethanol have the most desirable characteristics for groundloop applications. The overall heat transfer characteristics of these fluids remain high although care must be taken when handling pure alcohols since they are extremely flammable. Once mixed in a typical 25% by volume ratio with water the solution is not flammable. In situations where alcohols are not allowed as a loop fluid due to local regulations then propylene glycol is a non-toxic alternative which can be substituted . Propylene glycol should only be used in cases where alcohols are not permitted since the heat transfer characteristics are less desirable and it becomes more viscous at low temperatures, increasing pumping power.

The volume of fluid that your loop system holds can be closely estimated by totaling the number of ft. of each size pipe in the system and referencing **TABLE 20** the for approximate volume per 100 ft.

EMWT-HSCW units are particular in that there is no isolation between the indoor and outdoor loops. The entire system (floor zones, fan coils, etc) uses the ground loop fluid This must be accounted for when calculating the amount of antifreeze required. Failure to do so will result in reduced freeze protection and could cause the heat exchanger to freeze and rupture, voiding the warranty.

When the volume of the loop has been calculated and the appropriate amount of antifreeze is ready for addition by referencing **TABLE 19** , drain the equivalent amount of water from the flush cart or mixing barrel and replace it with the antifreeze.

When using alcohols, be sure to inject below the water line to reduce initial volatility of the pure antifreeze. It will be necessary to refill the tank with antifreeze several times to get all the antifreeze into the system. Pump the system for 5 to 10 minutes longer to ensure the remaining fluid has been well mixed.

TABLE 20 - Volume of fluid per 100 ft. of pipe				
		Volume /100ft.		
Type of Pipe	**Diameter**	**Igal**	**USgal**	**L**
Copper	**1”**	**3.4**	**4.1**	**15.5**
	1-1/4”	**5.3**	**6.4**	**24.2**
	1-1/2”	**7.7**	**9.2**	**34.8**
Rubber Hose	**1”**	**3.2**	**3.9**	**14.8**
Polyethylene	**3/4” IPS SDR11**	**2.3**	**2.8**	**10.6**
	1” IPS SDR11	**3.7**	**4.5**	**17.0**
	1-1/4” IPS SDR11	**6.7**	**8.0**	**30.3**
	1-1/2” IPS SDR11	**9.1**	**10.9**	**41.3**
	2” IPS SDR11	**15.0**	**18.0**	**68.1**
EMWT-HSCW	**Average**	**55.0**	**66.0**	**250**
Flush Cart Tank	**15”D x 3 ft. high**	**23.3**	**28**	**106**

INITIAL PRESSURIZATION

At this point open all valves in the flow circuit and slowly close off the supply and return flush cart valves in a manner that leaves about **20-30 psig**. on the system. If an air bladder expansion tank is used it should be charged to the above pressure before actual water pressure is put on the system . Systems without an expansion tank will experience greater fluctuations in pressure between the heating and cooling seasons, causing pressure gauges to have different values as the loop temperature changes. This fluctuation is normal since expansion and contraction of the loop fluid must be handled by the elasticity of the plastic loop.

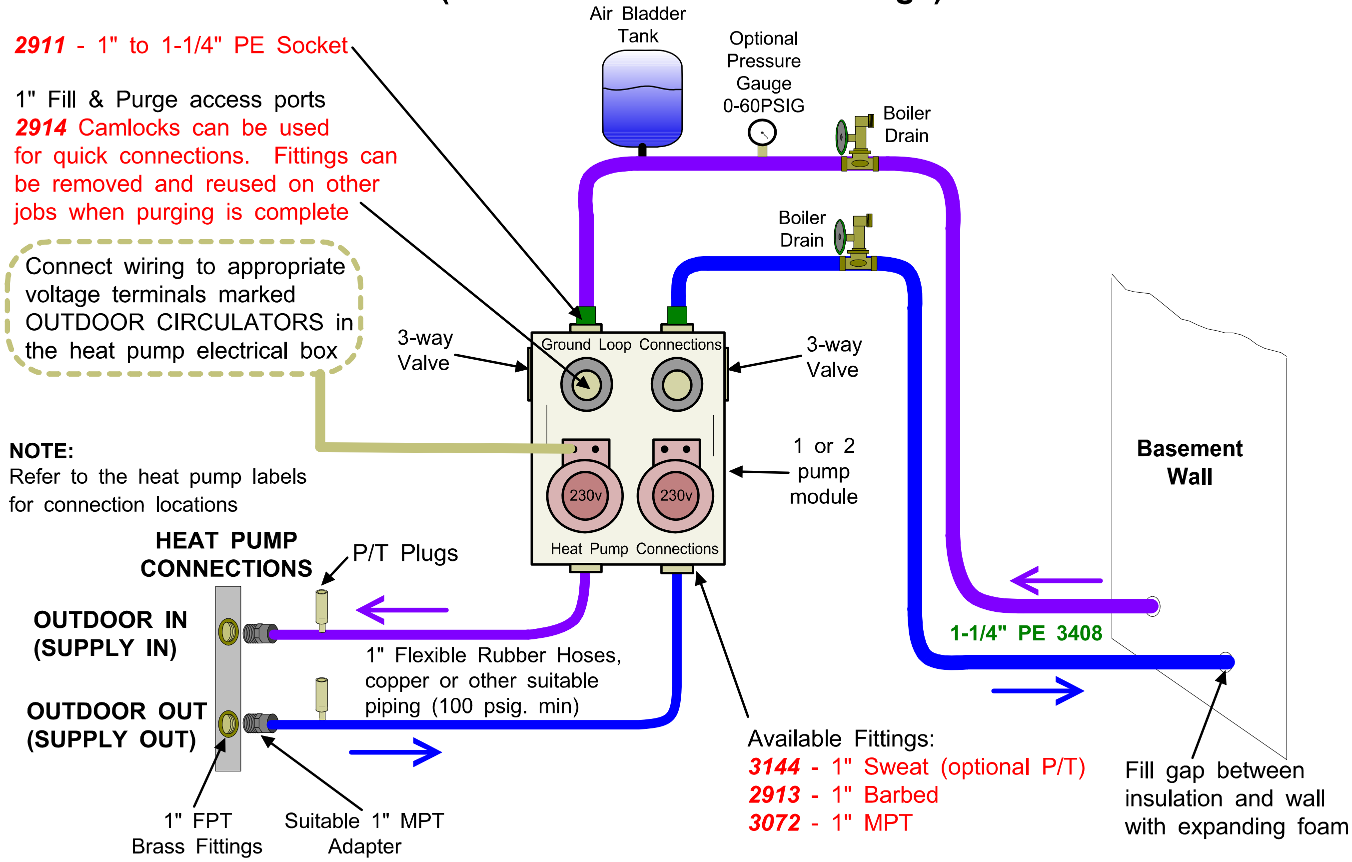
- Pressurize the loop to a static pressure of **45 psig**. when installing a system in the fall going into the heating season.
- Pressurize the loop to a static pressure of **25 psig**. when installing a system in the spring or summer going into the cooling season.

After operating the heat pump for a period of time, any residual air in the system should be bled off and the static pressure should be verified and adjusted if necessary. Add additional water / antifreeze mix with the purge cart to bring the pressure back to the original setting if required.

PIPE INSULATION

All ground loop piping inside the structure (between the structure entry point and the heat pump) should be insulated with 3/8” thick closed cell pipe insulation to prevent condensation and dripping onto floors or walls.

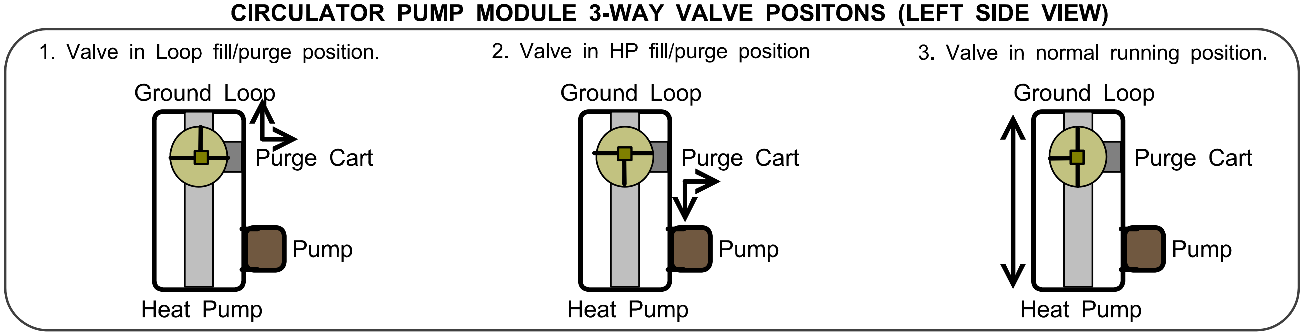
Geo-Flo Circulator Pump Module Installation
(Units with Brass FPT Fittings)



NOTES:

- Circulator Pump Module should be mounted vertically to minimize the possibility of air locking the circulators.
- All lines inside the structure and through the wall should be insualted with 3/8" to 1/2" thick closed cell pipe insulation.
- Holes through the foundation / structure should be filled with expanding foam from both sides to prevent leakage.
- Proper drainage material should be used on the outside of the wall to prevent water buildup.
- Pump module fittings are available from Maritime Geothermal Ltd., Geo-Flo Part Numbers are indicated above (italics).
- A pressure gauge is recommended if P/T plugs are not installed.
- The air bladder tank should be pressurized to the desired static pressure of the ground loop before installation.
- For most applications, a 1 pump module will accomodate NORDIC models sizes 25, 35, and 45, and a 2 pump module will accomodate sizes 55, 65 and 75. The total loop pressure drop including the headers, inside piping and heat exchanger drop should be calculated based on the antifreeze mixture and lowest desired entering water temperature. The pump module selected must provide the required flow at this calculated pressure drop value.

CIRCULATOR PUMP MODULE 3-WAY VALVE POSITONS (LEFT SIDE VIEW)



01	Initial Release	C. GEDDES	C. GEDDES	09 DEC 08
REV	ECO #	IMPL BY	APVD BY	DATE

Drawn By: Chris Geddes	Date: 09 DEC 08
Checked By: Chris Geddes	Date: 09 DEC 08
Approved By (ENG): Chris Geddes	Date: 09 DEC 08
Approved By (MFG)	Date
Approved By	Date

MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4

Drawing Name	Geo-Flo Circulator Pump Module Installation (Brass FPT)		
Size	Drawing Number	REV	SHEET
A	000906PDG	01	1 of 1

Startup Procedure

The following steps describe how to perform the startup procedure of the geothermal heat pump.

The EMWT-HSCW Series Two-Stage R410a Startup Record located in this manual is used in conjunction with this startup procedure to provide a detailed record of the installation. A completed copy should be left on site, a copy kept on file by the installer and a copy should be sent to Maritime Geothermal Ltd.

Check the boxes or fill in the data as each step is completed. For data boxes, circle the appropriate units. Fill in the top section of all three copies, or one copy if photocopies can be made after the startup has been completed.

PRE-START INSPECTION

Heating and Cooling Zone Loops:

1. Verify that all shutoff valves inside the unit are fully open.
2. Verify that the entire system has been flooded and all the air has been purged as much as possible. Further purging may be required after the system has been operating for a while.
3. Verify that the loop contains the proper mix of antifreeze (if used) for the intended application. If applicable, record the type of antifreeze and the mixture value on the startup sheet, circle % Vol. or % Weight.
4. Record the static loop pressure on the startup sheet. **The value must be above 12PSIG**. The electric heat will not function if the pressure is below this value.

Outdoor Loop (Ground Loop):

1. Verify that all shutoff valves are fully open and there are no restrictions in the piping from the heat pump to the ground loop, and that full flow is available to the heat pump.
2. Verify that the entire system has been flooded and all the air has been purged as much as possible. Further purging may be required after the system has been operating for a while.
3. Verify that the loop contains the proper mix of antifreeze for the intended application. Record the type of antifreeze and the mixture value on the startup sheet; circle % Vol. or % Weight.
4. Record the static loop pressure on the startup sheet.

Domestic Hot Water (if equipped):

1. Verify that all shutoff valves are fully open and there are no restrictions in the piping from the heat pump to the domestic hot water tank.
2. Verify that the entire system has been flooded and all the air has been purged as much as possible. Further purging may be required after the system has been operating for a while.
3. Verify that the brown wire with the insulated terminal is disconnected in the electrical box. Refer to the schematic diagram for more information.

Electrical:

1. **Ensure the power to the unit is off.**
2. Verify all high voltage connections. Ensure that there are no stray wire strands, all connections are tight and the ground wire is connected tightly to the ground connector for the heat pump and plenum heater.
3. Record the fuse / circuit breaker size and wire gauge for the heat pump.
4. Verify that the control connections to the are properly connected and all control signals are off.
5. Turn both breakers off in the unit electrical box , so that the unit will not start when the power is turned on.
6. Verify that the circulator pumps are connected to the proper voltage terminals in the heat pump. Record the voltages of the circulator pumps.
7. Ensure all access panels except the one that provides access to the electrical box are in place.

UNIT STARTUP

The unit is now ready to be started. The steps below outline the procedure for starting the unit and verifying proper operation of the unit. **It is recommended that safety glasses be worn during the following procedures.**

Preparation:

1. Remove the caps from the service ports and connect a refrigeration manifold set to the unit.
2. Turn the power on to the heat pump and set all controls (including all zone thermostats) to OFF.
3. Measure the following voltages on the power block and record them on the startup sheet: L1-L2, L2-L3, L1-L3.
4. Verify that the green light on the side of the cabinet is on.

Testing:

1. Turn the compressor breaker on. The compressor will start. Note that the outdoor pump module does not start. It will not start until the cold tank reaches **40°F (4.58°C)**
2. Check the refrigeration gauges. The suction and discharge pressures will depend on the loop temperatures, but they should be about **90-110PSIG** and **250-320PSIG** respectively for a typical start-up.
3. Monitoring the refrigeration gauges while the unit runs. Monitor the outdoor pump module contactor (or LED).
4. Record the suction pressure when the outdoor pump module turns on.
5. Record the following data 2 minutes after the outdoor pump module turns on:
    1. Suction pressure
    2. Discharge pressure
    3. Outdoor Loop In (Supply In) temperature
    4. Outdoor Loop Out (Supply Out) temperature
    5. Outdoor Delta T (should be between **5-8°F, 3-4°C**)
    6. Outdoor flow (if available)
    7. Compressor L1(C) current (black wire, place meter between electrical box and compressor)
6. Let the unit run through a cycle. Record the Heating Stage 1 setpoint (default **108°F (42°C)**) and the discharge pressure when the unit shuts off.
7. For units with a desuperheater, turn the power off to the unit. Connect the brown wire with the blue insulated terminal to the compressor contactor as shown in the electrical box diagram. Turn the power to the unit on.
8. Open a heating zone (or zones) and let the Hot Tank cool down until Heating Stage 3 is activated at **85°F (29°C)**. Close the heating zone(s).
9. Verify the DHW IN and DHW OUT temperatures (if applicable) by hand **(caution: pipes get hot).** If the DHW OUT line does not become hotter than the DHW IN line the circulator is air locked. Bleed the air from the system and check the temperature differential again to ensure there is flow from the circulator.
10. Turn on the electric heat breaker inside the unit. The yellow light on the side of the unit should turn on. Measure the L1 current draw with a clamp meter and record the value. It should be between 45 and 52A.
11. Open a cooling zone (or zones) and let the Cold Tank warm up. The Hot Tank temperature will rise as well. Record the discharge pressure when the outdoor pump module turns on to cool the Hot Tank, the default value is **114°F (46°C).** Note that the compressor must be kept running by a cooling call in order to do this step. Omit this step if this is not possible at the time of the startup.

Final Inspection:

1. Turn the compressor breaker off. Set the controller to the final settings and record the values.
2. Turn the power off to the unit and remove all test equipment. Turn the compressor breaker back on.
3. Install the electrical box cover and the access panel on the heat pump. Install the service port caps securely to prevent refrigerant loss.
4. Do a final check for leaks in the ground loop system and ensure the area is clean.
5. Turn the power to the unit on. Set all zone thermostats to the desired values.

Startup Record:

1. The installer shall sign and date the bottom of the Startup Record and then have the homeowner sign as well. The installer shall leave the Startup Record with the homeowner, retain a copy for filing and send a copy to Maritime Geothermal Ltd. for warranty registration.

Startup Record Sheet—EMWT-HSCW Series Size 25-75 Two-Stage R410a

Installation Site		**Startup Date**	**Installer**	
City			**Company**	
Province		**Check boxes unless asked to record data. Circle data units.**	**Model**	
Country			**Serial #**	
Homeowner Name		**Homeowner Phone #**		

PRE-START INSPECTION

Heating and Cooling Zone Loops	All shut-off valve are open (full flow available)							
	Loop is full and purged of air							
	Antifreeze type							
	Antifreeze concentration		% Volume		% Weight			
	Loop static pressure		PSI	kPa				
Ground Loop System	All shut-off valve are open (full flow available)							
	Loop is full and purged of air							
	Antifreeze type							
	Antifreeze concentration		% Volume		% Weight			
	Loop static pressure		PSI	kPa				
Domestic Hot Water	All shut-off valves are open							
	Lines are full and purged							
	Desuperheater pump wire is disconnected							
Electrical	High voltage connections are correct and securely fastened							
	Circuit breaker (or fuse) size and wire gauge for Heat Pump		A		Ga.			
	Circulator pump voltages (Outdoor 1, Outdoor 2)		V		V		V	
	Low voltage connections are correct and securely fastened							

STARTUP DATA

Preparation	Voltage across L1 and L2, L1 and L3, L2 and L3							VAC
	Green Light is ON							
Cold Tank Limit	Suction Pressure when outdoor pump module turns on		psig	kPa				
Data 2 minutes after outdoor pump turns on	Suction Pressure / Discharge Pressure					psig	kPa	
	Outdoor In (Supply In), Outdoor Out (Supply Out), and Delta T		In		Out		°F	°C
	Outdoor Flow		Igpm	USgpm		L/s		
	Compressor L1 (black wire) current		A					
	Heating aquastat setpoint and discharge pressure at cycle end		°F	°C		psig	kPa	
	Domestic Hot Water functioning							
	Yellow light is ON. Electric element L1 current draw			A				
Hot Tank Limit	Discharge Pressure when outdoor pump module turns on		psig	kPa				
Final Controller Settings	Heating S1 Setpoint, S1 Delta, S2 Set, S2 Delta, S3 Set, S3 Delta							°F°C
	Cooling S1 Setpoint, S1 Delta, S2 Set, S2 Delta							°F°C

Date:		**Installer Signature:**		**Homeowner Signature:**	

A total of three copies are required, one for the homeowner, one for the installer and on to be sent to Maritime Geothermal Ltd.

General Maintenance

GENERAL MAINTENANCE SCHEDULE		
Item	**Interval**	**Procedure**
Contactor	1 year	Inspect for pitted or burned points. Replace if necessary.
Heat exchangers	As required*	Clean as per HEAT EXHCANGER FLUSING PROCEDURE below.
Circulators	1 year	Inspect for corrosion or leaks
Expansion Tank	1 year	Inspect for corrosion or leaks, verify bladder pressure.
***Generally not required for closed loop systems. Both exchangers have the same antifreeze mix in them.**		

COAXIAL HEAT EXCHANGER FLUSHING PROCEDURE—GROUND LOOP	
STEP 1	Isolate the heat exchanger by placing the pump module valves in the exchanger flushing position.
STEP 2	Connect a compressed air and a drain pipe to the pump module purge ports and blow the anti-freeze solution into a clean 5 gallon bucket.
STEP 3	Connect a purge cart to the pump module purge ports.
STEP 4	Place 2 gallons of RYDLYME in the purge cart. Circulate the fluid through the heat exchanger for at least 2 hours (3 recommended).
STEP 5	Disconnect the purge cart and dispose of the solution. RYDLYME is non-toxic and biodegradable and as such can be poured down a drain. Clean the purge cart thoroughly.
STEP 6	Connect fresh water and a drain to the pump module purge ports and flush the exchanger for several minutes.
STEP 7	Blow the heat exchanger out with compressed air as per STEP 2 and dump the water down a drain.
STEP 8	Connect the purge cart to the pump module purge ports. Re-fill and purge the heat exchanger with as per standard procedures (the anti-freeze from STEP 2 can be re-used).
STEP 9	Disconnect the purge cart and set the pump module valves back to the original positions.
STEP 10	Operate the system and check for improved performance.
***Depending on the plumbing, there should be either unions or boiler drains for to access the heat exchanger.**	

PURGING THE SYSTEM

There are several ball valves and boiler drain valves in the unit that can be used to help purge the system. The Electonic Ball Valves (EBV) located near the bottom of the cold tank on the left side of the unit can be opened and closed manually as well to direct flow while purging. Adjust valves as necessary to purge each individual circuit in this unit. It can take some time to completely flush the system particularly if there are several zones.

IMPORTANT NOTE: In order to properly purge the **Cold Indoor Circulator** (refer to **Diagram B**) close the ball valve in the bottom port of the cold tank and connect a supply line to the boiler drain next to it. This forces fluid through this loop, it will not get purged otherwise. Ensure all ball valves are open once purging has been completed.

Troubleshooting Guide

The following steps are for troubleshooting the geothermal heat pump. If the problem is with the domestic hot water or the auxilliary/backup electric heat, proceed to the relevant section at the end of the troubleshooting guide.

STEP 1: Remove the door and electrical box cover. Verify that the LCD display is powered up. If it is not, proceed to POWER SUPPLY TROUBLE SHOOTING, otherwise proceed to STEP 2.

NOTE: Either the Hot Tank temperature must be below the Stage 1 Activation value or the Cold Tank temperature must be above the Stage 2 activation value in order to start the compressor. Adjust the values or open a zone to start the compressor if the tanks are satisfied.

STEP 2: Check the Service 1 display to see the lockout status. If there is a lockout, record it. Turn the power off, wait 10 seconds and turn the power back on.

STEP 3: If a lockout occurs on the Service 1 display and the compressor does not attempt to start, proceed to the PRESSURE CONTROL TROUBLESHOOTING section, otherwise proceed to STEP 4.

STEP 4: If a lockout does not appear and the compressor does not attempt to start, attempts to start but cannot, starts hard, or starts but does not sound normal, proceed to the COMPRESSOR TROUBLESHOOTING section, otherwise proceed to STEP 5.

STEP 5: If the compressor starts and sounds normal, this means the compressor is OK and the problem lies elsewhere. Proceed to the OPERATION TROUBLESHOOTING section.

STEP 6: If the heat pump appears to be operating properly but no hot or cold water is making it to the zones proceed to the ZONE TROUBLESHOOTING section.

POWER SUPPLY TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
No power to the heat pump	Disconnect switch open (if installed)	Verify disconnect switch is in the ON position.	Determine why the disconnect switch was opened, if all is OK close the switch.
	Fuse blown / Breaker Tripped.	At heat pump disconnect box, voltmeter shows 230VAC on the line side but not on the load side.	Reset breaker or replace fuse with proper size and type. (Time-delay type “D”)
No LCD display	Blown Primary or Secondary fuse on transformer.	Visually inspect. Remove fuse and check for continuity if in doubt.	Replace fuse.
	Faulty transformer	230VAC is present across H1 and H4 of the transformer but 24VAC is not present across X1 and X4 of the transformer.	Replace transformer.
	Faulty LCD Display	Remove the front cover of the display. 24VAC is present across 24V and COM of the pins but there is no display.	Replace LCD display.

PRESSURE CONTROL TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High Pressure Control	Faulty High Pressure Control (open). *HP pressures must be at static levels.	Verify if there is **5VDC** across pin 5 and 6 of the controller input connector (bottom connector).	Replace high pressure control if **5VDC** is present
	Faulty Controller	Verify if there is **5VDC** across pin 5 and 4 of the controller input connector (bottom connector).	Replace controller if no voltage is present and the Service 1 display High Lockout parameter shows 1. .
Low Pressure Control	Unit out of refrigerant.	Check static refrigeration pressure of the unit for a very low value.	Locate the leak and repair it. Spray nine, a sniffer and dye are common methods of locating a leak.
	Faulty Low pressure control (open). *HP pressures must be at static levels.	Verify if there is **5VDC** across pin 5 and 4 of the controller input connector (bottom connector).	Replace low pressure control if **5VDC** is present
	Faulty Controller	Verify if there is **5VDC** across pin 5 and 4 of the controller input connector (bottom connector).	Replace controller if no voltage is present and the Service 1 display Low Lockout parameter shows 1.

COMPRESSOR TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Compressor will not start	Manual High pressure control tripped.	Press the button on the control, it will click when pressed.	Proceed to Operation Trouble-shooting to rectify the problem.
	Tripped or faulty com-pressor breaker	Reset if tripped. If not tripped verify that there is 230VAC across L1 and L3 of the compressor contactor.	Determine why breaker was tripped. Replace breaker if faulty.
	Faulty controller.	Compressor Low LED is on but no 24V across the compressor contactor coil.	Replace controller.
	Faulty run capacitor.	Check value with capacitance meter. Should match label on capacitor	Replace if faulty.
	Loose or faulty wiring.	Check all compressor wiring, including inside compressor electrical box.	Fix any loose connections. Re-place any damaged wires.
	Faulty compressor contactor.	Voltage on line side with contactor held closed, but no voltage on one or both terminals on the load side. Points pitted or burned. Or, 24VAC across coil but contactor will not engage.	Replace contactor.
	Thermal overload on compressor tripped.	Ohmmeter shows reading when placed across R and S terminals and infinity between C & R or C & S. A valid re-sistance reading is present again after the compressor has cooled down.	Proceed to Operation Trouble-shooting to determine the cause of the thermal overload trip.
	Burned out motor (open winding)	Remove wires from compressor. Ohmmeter shows infinite resistance between any two terminals Note: Be sure compressor overload has had a chance to reset. If compressor is hot this may take several hours.	Replace the compressor.
	Burned out motor (shorted windings)	Remove wires from compressor. Re-sistance between any two terminals is below the specified value.	Replace the compressor.
	Motor shorted to ground.	Remove wires from compressor. Check for infinite resistance between each ter-minal and ground.	If any terminal to ground is not infinite replace the compressor.
	Seized compressor due to locked or damaged mechanism.	Compressor attempts to start but trips its internal overload after a few seconds. (Run capacitor already verified)	Attempt to “rock” compressor free. If normal operation cannot be established, replace compressor.
Compressor starts hard	Start capacitor faulty.	Check with capacitance meter. Check for black residue around blowout hole on top of capacitor.	Replace if faulty. Remove black residue in electrical box if any.
	Potential Relay faulty	Replace with new one and verify com-pressor starts properly.	Replace if faulty.
	Compressor is “tight” due to damaged mechanism	Compressor attempts to start but trips its internal overload after a few seconds. Run capacitor has been verified already.	Attempt to “rock” compressor free. If normal operation cannot be es-tablished, replace compressor.
Compressor Stage 2 will not activate	Faulty controller	Compressor High LED is on but no 24V across pin 11(D02) of the controller out-put connector and C of the terminal strip.	Replace controller
	Faulty Stage 2 module.	24VAC is present across pin 11(D02) of the controller output connector and C of the terminal strip.	Replace module if signal is pre-sent.

OPERATION TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High Discharge Pressure	Low or no flow in Hot Indoor Loop (condenser to Hot Tank)	Check that isolation flanges and any ball valves are open. Verify 115VAC to pump. Check gauges for pressure drop.	Ensure flow path is unrestricted. Replace pump if faulty.
	Faulty controller	Valve to Hot Tank LED is on but no 24VAC across pin 7 (DO4) and C of the terminal strip	Replace controller.
	Faulty three way valve or valve head.	24VAC signal to valve head but valve is not directed to the Hot Tank. Head can be removed to verify if it moves.	Replace valve head and/or valve.
	TXV closed too far.	Verify superheat. It should be between 8-12°F (3-6°C). Superheat will be high if TXV is closed too far.	Adjust TXV to obtain 8-12°F (3-6°C) superheat.
	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Filter-drier plugged	Feel each end of the filter- drier, it should be the same temperature. If there is a temperature difference then it is plugged. Also causes low suction pressure.	Replace filter-drier.
	Unit is overcharged. (Only possible if unit has been opened in the field and incorrectly charged).	High sub-cooling, low delta T across air coil.	Remove 1/2lb of refrigerant at a time and verify that the discharge pressure reduces.
	Dirty or fouled heat exchanger (condenser).	Disconnect the outdoor loop lines and check the inside of the pipes for scale deposits.	Have a qualified service technician backflush the system.
	Entering liquid temperature too warm.	Most likely caused by undersized ground loop.	Verify the ground loop sizing. Increase the size of the ground loop if undersized.
Low Suction Pressure	Low or no flow in Cold Indoor Loop (condenser to Cold Tank)	Check that isolation flanges and any ball valves are open. Verify 115VAC to pump. Check gauges for pressure drop.	Ensure flow path is unrestricted. Replace pump if faulty.
	Low or no Outdoor liquid flow	Delta T across the Outdoor Loop ports should be between 5-7°F (3-4°C), or compare pressure drop to the tables for the unit.	Determine the cause of the flow restriction and correct it. Verify pumps have power and are working and sized correctly.
	Entering liquid temperature too cold.	Measure the entering liquid temperature. Most likely caused by undersized ground loop.	Increase the size of the ground loop.
	Dirty or fouled heat exchanger (evaporator).	Disconnect the outdoor loop lines and check the inside of the pipes for scale deposits.	Have a qualified service technician backflush the system.

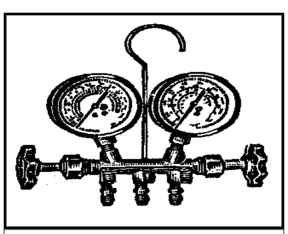
OPERATION TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Low Suction Pressure (continued)	Hot Tank temperature too low	Measure temperature. Should be above 60°F (15°C).	Restrict Heating Zone flow temporarily until Hot Tank comes up to temperature.
	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure. TXV may be frosting up.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Low refrigerant charge.	Entering liquid temperature, flow and entering air temperature are good but suction is low. Check static refrigeration pressure of the unit for a very low value.	Locate the leak and repair it. Spray nine, a sniffer and dye are common methods of locating a leak.
	Faulty compressor, not pumping.	Pressures change only slightly from static values when compressor is started.	Replace compressor.
High Suction Pressure (may appear to not be pumping)	TXV adjusted too far open.	Verify superheat. It should be between 8-12°F (3-6°C). Superheat will be low if TXV is open too far.	Adjust TXV to obtain 8-12°F (3-6°C) superheat.
	TXV stuck open.	Adjusting the TXV does not affect the superheat or the suction pressure. Low super heat and discharge pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
Compressor frosting up	See Low Suction Pressure in this section.		
TXV frosting up	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
Random high pressure trip (does not occur while on site)	Intermittent Hot Indoor Loop circulator (condenser to Hot Tank)	Verify wiring and motor are is good.	Correct the wiring or replace the circulator.
Random manual high pressure trip (does not occur while on site)	Faulty compressor contactor.	Points pitted or burned. Contactor sometimes sticks causing the compressor to run when it shouldn't	Replace contactor.
Random low pressure trip (does not occur while on site)	Intermittent Cold Indoor Loop circulator (condenser to Cold Tank)	Verify wiring and motor are good.	Correct the wiring or replace the circulator.
	Intermittent Outdoor Loop circulator.	Verify wiring, contactor and motor is good.	Correct the wiring or replace the circulator.

ELECTRIC ELEMENT TROUBLE SHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
No Electric Heat	Tripped or faulty electric heat breaker.	Reset if tripped. If not tripped verify that there is 230VAC across L1 and L3 of the electric heat contactor.	Determine why breaker was tripped. Replace breaker if faulty.
	Insufficient system pressure.	Verify system pressure. Must have at least **12PSIG** to engage the safety pressure switch.	Increase system pressure.
	Faulty controller.	Hot tank temperature is below the Heating Stage 3 activation point but the Electric Heat LED is not on	Replace controller.
	Faulty controller.	Electric Heat LED is on but 24VAC is not present across pin 9 (D03) of the controller output connector and C of the terminal strip.	Replace controller.
	Faulty electric heat contactor.	Voltage on line side with contactor held closed, but no voltage on one or both terminals on the load side. Points pitted or burned. Or, 24VAC across coil but contactor will not engage.	Replace contactor.
	Faulty elements.	With power off to the unit, measure the resistance across the T1 and T3 terminals of the electric heat contactor . Under 6 ohms = both elements good Infinity = both elements bad.	Replace the faulty elements.
Low Electric Heat	One faulty element.	With power off to the unit, measure the resistance across the T1 and T3 terminals of the electric heat contactor . 6 to 12ohms = one element bad	Measure each element individually to determine the faulty one and replace it.

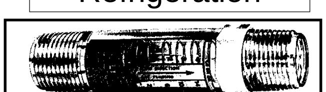
ZONE TROUBLE SHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
No hot water to individual heating zone	Faulty zone thermostat, wiring or zone valve head(s)	No 24VAC signal present across T and C of the heat pump terminal strip.	Locate the problem and correct it.
	Faulty zone valve(s)	Other zones work, 24VAC is present across T and C of the heat pump terminal strip but no hot water reaches the zone.	Clean or replace zone valve(s)
No hot water to any heating zones	Shut off valve closed.	Verify that all valves in the zone loops are open, including isolation valves at the zone circulator inside the unit.	Open any valves that are closed.
	Faulty hot zone circulator contactor.	24VAC is present across T and C of the heat pump terminal strip but the contactor does not energize. Or, contactor is energized but 115VAC is not present across the wire on the load terminal and ground.	Replace contactor.
	Faulty hot zone circulator.	115VAC is present across the wire on the load terminal of the hot zone circulator and ground but circulator pump is not working.	Close isolation valves and remove circulator pump head. Verify operation of the impeller. Clean or replace if faulty.
No cold water to individual cooling zone	Faulty zone thermostat, wiring or zone valve head(s)	No 24VAC signal present across V and C of the heat pump terminal strip.	Locate the problem and correct it.
	Faulty zone valve(s)	Other zones work, 24VAC is present across V and C of the heat pump terminal strip but no hot water reaches the zone.	Clean or replace zone valve(s)
No cold water to any cooling zones	Shut off valve closed.	Verify that all valves in the zone loops are open, including isolation valves at the zone circulator inside the unit.	Open any valves that are closed.
	Faulty cold zone circulator contactor.	24VAC is present across V and C of the heat pump terminal strip but the contactor does not energize. Or, contactor is energized but 115VAC is not present across the wire on the load terminal and ground.	Replace contactor.
	Faulty cold zone circulator.	115VAC is present across the wire on the load terminal of the cold zone circulator and ground but circulator pump is not working.	Close isolation valves and remove circulator pump head. Verify operation of the impeller. Clean or replace if faulty.

DOMESTIC HOT WATER (DHW) TROUBLE SHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Insufficient hot water (Tank Problem)	Thermostat on hot water tank set too low. Should be set at 120°F. (140°F if required by local code)	Visually inspect the setting.	Readjust the setting to 120°F. (140°F if required by local code)
	Breaker tripped, or fuse blown in electrical supply to hot water tank.	Check both line and load sides of fuses. If switch is open determine why.	Replace blown fuse or reset breaker.
	Reset button tripped on hot water tank.	Check voltage at elements with multimeter.	Push reset button.
Insufficient hot water (Heat Pump Problem)	Circulator pump not operating.	Visually inspect the pump to see if shaft is turning. Use an amprobe to measure current draw.	Replace if faulty.
	Blockage or restriction in the water line or hot water heat exchanger.	Check water flow and power to pump. Check water lines for obstruction	Remove obstruction in water lines. Acid treat the domestic hot water coil.
	Faulty DHW cutout (failed open).	Check contact operation. Should close at 120°F and open at 140°F.	Replace DHW cutout if faulty.
	Heat pump not running enough hours to make sufficient hot water.	Note the amount of time the heat pump runs in any given hour.	Temporarily turn up the tank thermostats until colder weather creates longer run cycles.
Water is too hot.	Faulty DHW cutout (failed closed).	Check contact operation. Should close at 120°F and open at 140°F.	Replace DHW cutout if faulty.
	Thermostat on hot water tank set too high. Should be set at 120°F. (140°F if required by local code)	Visually inspect the setting.	Readjust the setting to 120°F. (140°F if required by local code)

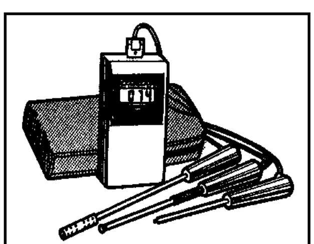
Trouble Shooting Tools



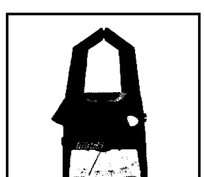
Refrigeration



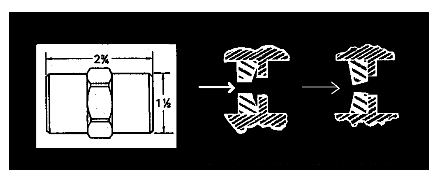
In-line Flowmeter



Digital



Multimeter - Voltmeter /



Dole flow control Valve

The Dole® flow control is a simple, self-cleaning device designed to deliver a constant volume of water from any outlet whether the pressure is 15 psig or as high as 125 psi. The controlling mechanism consists of a flexible orifice that varies its area inversely with pressure so that a constant flow is maintained.

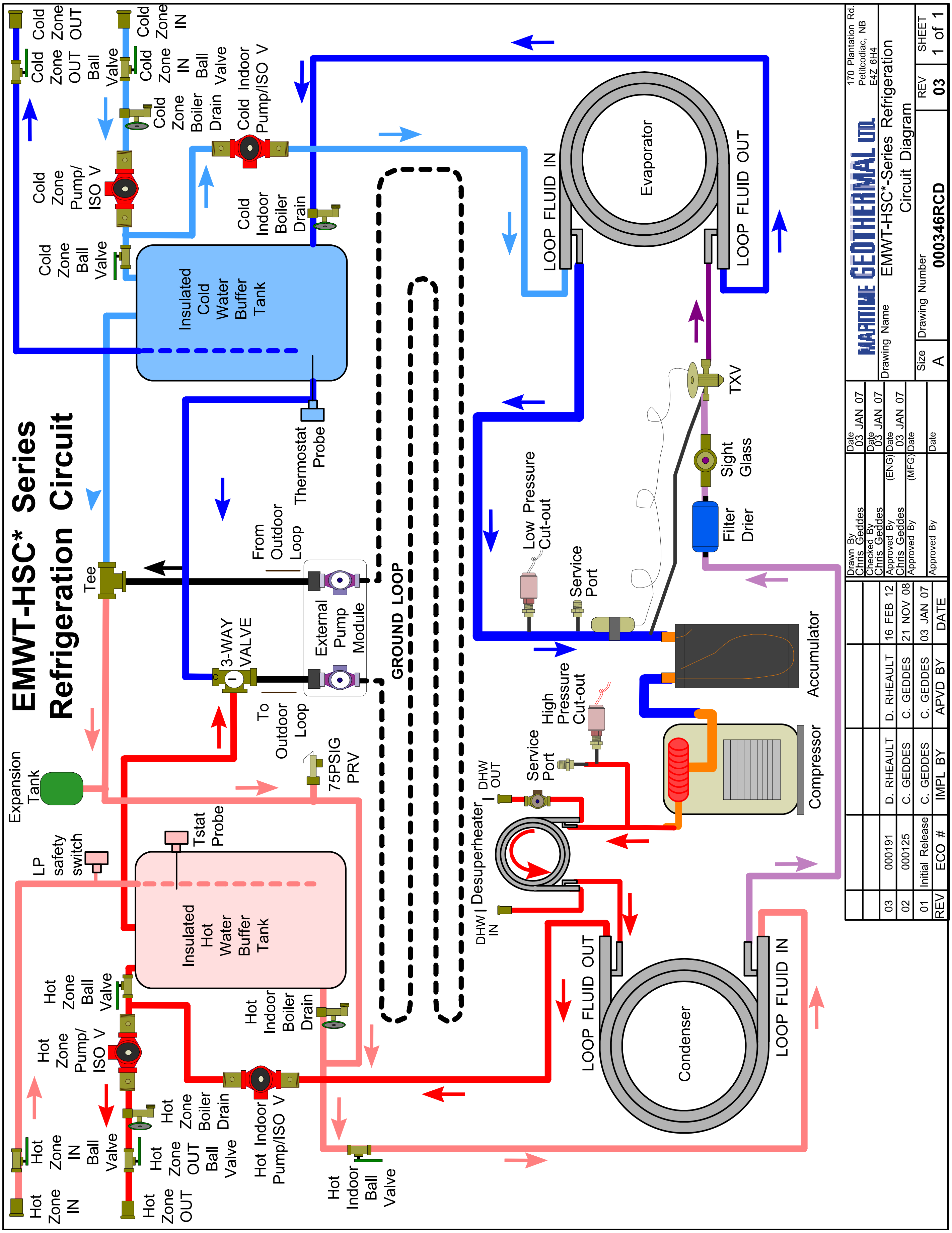
REPAIR PROCEDURES

PUMP DOWN PROCEDURE	
STEP 1	Connect the refrigerant recovery unit to the heat pump service ports via a refrigeration charging manifold and to a recovery tank as per the instructions in the recovery unit manual. **If there was a compressor burn out, the refrigerant cannot be reused and must be disposed of according to local codes.**
STEP 2	All water coil heat exchangers must either have full flow or be completely drained of fluid before recovery begins. Failure to do so can freeze and rupture the heat exchanger, voiding its warranty. (Note that this does not apply to double wall domestic hot water exchangers (desuperheater coils)
STEP 3	Ensure all hose connections are properly purged of air. Start the refrigerant recovery as per the instructions in the recovery unit manual.
STEP 4	Allow the recovery unit suction pressure to reach a vacuum. Once achieved, close the charging manifold valves. Shut down, purge and disconnect the recovery unit as per the instructions in its manual. Ensure the recovery tank valve is closed before disconnecting the hose to it.
STEP 5	Connect a nitrogen tank to the charging manifold and add nitrogen to the heat pump until a positive pressure of 5-10PSIG is reached. This prevents air from being sucked into the unit by the vacuum when the hoses are disconnected.
STEP 6	The heat pump is now ready for repairs. Always ensure nitrogen is flowing through the system during any soldering procedures to prevent soot buildup inside the pipes. Maritime Geothermal Ltd. recommends replacing the liquid line filter-drier anytime the refrigeration system has been exposed to the atmosphere.

VACUUM AND CHARGING PROCEDURE	
STEP 1	After completion of repairs and nitrogen pressure testing, the refrigeration circuit is ready for vacuuming.
STEP 2	Release the refrigerant circuit pressure and connect the vacuum pump to the charging manifold. Start the vacuum pump and open the charging manifold valves. Vacuum until the vacuum gauge remains at less than 500 microns for at least 1 minute with the vacuum pump valve closed.
STEP 3	Close the charging manifold valves then shut off and disconnect the vacuum pump. Place a refrigerant tank with the proper refrigerant on a scale and connect it to the charging manifold. Purge the hose to the tank.
STEP 4	Weigh in the appropriate amount of refrigerant through the low pressure (suction) service port. Refer to the label on the unit or the **Refrigerant Charge Chart** in the **MODEL SPECIFIC INFORMATION** section for the proper charge amount.
STEP 5	If the unit will not accept the entire charge, the remainder can be added through the low pressure service port after the unit has been restarted.

REPLACMENT PROCEDURE FOR A COMPRESSOR BURN-OUT	
STEP 1	Pump down the unit as per the Pump Down Procedure above. Discard the refrigerant according to local codes.
STEP 2	Replace the compressor. Replace the liquid line filter-drier.
STEP 3	Vacuum the unit until it remains under 500 microns for several minutes with the vacuum pump valve closed.
STEP 4	Charge the unit with **NEW REFRIGERANT** and operate it for continuously for 2 hours. Pump down the unit and replace the filter-drier. Vacuum the unit until it remains under 500 microns for several minutes with the vacuum pump valve closed.
STEP 5	Charge the unit (refrigerant can be re-used) and operate it for 2-3 days. Perform an acid test. If it fails, pump down the unit and replace the filter-drier.
STEP 6	Charge the unit (refrigerant can be re-used) and operate it for 2 weeks. Perform and acid test, If it fails pump down the unit and replace the filter-drier.
STEP 7	Charge the unit a final time. Unit should now be clean and repeated future burn-outs can be avoided.

REFRIGERATION CIRCUIT DIAGRAM



Model Specific Information

This section provides general information particular to each model. For complete specifications please see the specifications document for the desired model.

REFRIGERANT CHARGE CHART

Table 21 - Refrigerant - R410a		
SIZE	Lbs.	kg
65	8.0	3.6
75	9.0	4.1
System contains POE oil.		

SHIPPING INFORMATION

Table 22 - Shipping Information				
MODEL	WEIGHT	DIMENSIONS in (cm)		
	Lbs. (kg)	L	W	H
65	TBD	86 (218)	36 (91)	48 (122)
75	TBD	86 (218)	36 (91)	48 (122)

STANDARD CAPACITY RATINGS

The tables below depict the results of standard capacity rating tests according to C13256-2, which is identical to ISO13256-2. Stage 1 values do not apply to single stage units. Refer to the Electrical Tables to determine which models are single stage.

NOTE: Due to the setup of this series of heat pumps, there is no actual reversing mode, the values in the cooling tables are what would be obtained when operating at the given conditions.

Table 23 - Standard Capacity Ratings - Ground Loop Heating* 60Hz											
EWT 104°F (40°C)								STAGE 1 - ELT 41°F (5°C) STAGE 2 - ELT 32°F (0°C)			
Model	Size	Liquid Flow (Outdoor & Indoor)			Outdoor Pressure Drop		Mode	Input Energy	Capacity		COP_H
	Tons	IGAL	USG	L/s	PSI	kPA		Watts	BTU/Hr	kW	W/W
65	5	12	14.4	0.91	5.3	36.3	Stage 1	3,370	37,600	11.0	3.27
							Stage 2	4,380	45,800	13.4	3.07
75	6	14	16.8	1.06	6.0	41.4	Stage 1	3,905	45,600	13.3	3.42
							Stage 2	4,740	51,400	15.1	3.18
* 15% NaCl by Weight Ground Loop Fluid											

Table 24 - Standard Capacity Ratings - Ground Water Heating 60Hz											
EWT 104°F (40°C)								ELT 50°F (10°C)			
Model	Size	Liquid Flow (Outdoor & Indoor)			Outdoor Pressure Drop		Mode	Input Energy	Capacity		COP_H
	Tons	IGAL	USG	L/s	PSI	kPA		Watts	BTU/Hr	kW	W/W
65	5	12	14.4	0.91	4.5	31.2	Stage 1	3,390	42,900	12.6	3.71
							Stage 2	4,545	58,800	17.2	3.79
75	6	14	16.8	1.06	4.9	33.5	Stage 1	3,860	52,200	15.3	3.96
							Stage 2	4,860	66,300	19.4	4.00

Table 25 - Standard Capacity Ratings - Ground Loop Cooling* 60Hz											
EWT 53.6°F (12°C)								STAGE 1 - ELT 68°F (20°C) STAGE 2 - ELT 77°F (25°C)			
Model	Size	Liquid Flow (Outdoor & Indoor)			Outdoor Pressure Drop		Mode	Input Energy	Capacity		COP_C
	Tons	IGAL	USG	L/s	PSI	kPA		Watts	BTU/Hr	kW	W/W
65	5	12	14.4	0.91	4.2	29.0	Stage 1	2,055	41,300	12.1	5.89
							Stage 2	3,345	51,500	15.1	4.51
75	6	14	16.8	1.06	5.1	35.0	Stage 1	2,605	48,200	14.0	5.42
							Stage 2	3,895	57,900	17.0	4.36

* 15% NaCl by Weight Ground Loop Fluid

Table 26 - Standard Capacity Ratings - Ground Water Cooling 60Hz											
EWT 53.6°F (12°C)								ELT 59°F (15°C)			
Model	Size	Liquid Flow (Outdoor & Indoor)			Outdoor Pressure Drop		Mode	Input Energy	Capacity		COP_C
	Tons	IGAL	USG	L/s	PSI	kPA		Watts	BTU/Hr	kW	W/W
65	5	12	14.4	0.91	3.9	26.9	Stage 1	1,800	42,900	12.6	7.00
							Stage 2	2,785	57,200	16.8	6.02
75	6	14	16.8	1.06	4.2	29.2	Stage 1	2,350	51,300	15.0	6.40
							Stage 2	3,335	64,900	19.0	5.70

CAPACITY RATINGS

Heating Data

EMWT-65-HSCW-P-1T						Nominal 5 ton								R410a 60 Hz	
Source Data (Outdoor Loop)						Power Consumption				Sink Data (Indoor Loop)					
ELT	Evap. Temp	Flow	LLT	Delta T	HAB	Total		Effective	**COPh**	EWT	Cond. Temp.	Flow	LWT	Delta T	**Net Output**
°F	°F	Igpm	°F	°F	BTU/Hr	Watts	Amps	Watts	**W/W**	°F	°F	Igpm	°F	°F	**BTU/Hr**
°C	°C	L/min	°C	°C	Watts					°C	°C	L/min	°C	°C	**Watts**
27.0	15	12.0	22.8	4.2	28,925	4,214	18.5	4,396	**2.90**	104.0	116	12.0	110.0	6.0	**43,553**
-2.8	-9.4	54.2	-5.1	2.3	8,475					40.0	46.7	54.2	43.4	3.4	**12,761**
33.0	20	12.0	28.3	4.7	32,309	4,230	18.6	4,412	**3.12**	104.0	116	12.0	110.5	6.5	**46,993**
0.6	-6.7	54.2	-2.0	2.6	9,467					40.0	46.7	54.2	43.6	3.6	**13,769**
39.0	25	12.0	33.9	5.1	35,722	4,294	18.9	4,477	**3.31**	104.0	117	12.0	111.0	7.0	**50,625**
3.9	-3.9	54.2	1.0	2.9	10,466					40.0	47.2	54.2	43.9	3.9	**14,833**
45.0	30	12.0	39.3	5.7	39,704	4,304	18.9	4,486	**3.57**	104.0	117	12.0	111.6	7.6	**54,639**
7.2	-1.1	54.2	4.0	3.2	11,633					40.0	47.2	54.2	44.2	4.2	**16,009**
50.0	35	12.0	43.7	6.3	43,732	4,538	19.2	4,709	**3.70**	104.0	118	12.0	112.3	8.3	**59,483**
10.0	1.7	54.2	6.5	3.5	12,813					40.0	47.8	54.2	44.6	4.6	**17,428**
56.0	40	12.0	49.0	7.0	48,380	4,545	19.3	4,716	**3.99**	104.0	118	12.0	112.9	8.9	**64,152**
13.3	4.4	54.2	9.5	3.9	14,175					40.0	47.8	54.2	45.0	5.0	**18,796**
62.0	45	12.0	54.4	7.6	53,022	4,607	19.5	4,778	**4.23**	104.0	119	12.0	113.6	9.6	**69,007**
16.7	7.2	54.2	12.4	4.2	15,535					40.0	48.3	54.2	45.3	5.3	**20,219**
68.0	50	12.0	59.6	8.4	58,398	4,613	19.6	4,784	**4.56**	104.0	119	12.0	114.3	10.3	**74,405**
20.0	10.0	54.2	15.3	4.7	17,110					40.0	48.3	54.2	45.7	5.7	**21,800**

Compressor: ZPS51K4E-PFV

Cooling Data

EMWT-65-HSCW-P-1T														R410a 60 Hz	
Source Data (Indoor Loop)						Power Consumption				Sink Data (Outdoor Loop)					
ELT	Evap. Temp	Flow	LLT	Delta T	**HAB**	Total		Effective	**Effi-ciency**	ELT	Cond. Temp.	Flow	LLT	Delta T	Rejec-tion
°F	°F	Igpm	°F	°F	**BTU/Hr**	Watts	Amps	Watts	**EER**	°F	°F	Igpm	°F	°F	BTU/Hr
°C	°C	L/min	°C	°C	**Watts**				**COPc**	°C	°C	L/min	°C	°C	Watts
53.6	33	12.0	45.7	7.9	**59,659**	2,343	10.7	2,510	**23.8**	49	70	12.0	58.4	9.4	67,656
12.0	0.6	54.2	7.6	4.4	**17,480**				**6.96**	9	21.1	54.2	14.7	5.2	19,823
53.6	33	12.0	45.9	7.7	**58,382**	2,544	11.4	2,711	**21.5**	54	75	12.0	63.3	9.3	67,066
12.0	0.6	54.2	7.7	4.3	**17,106**				**6.31**	12	23.9	54.2	17.4	5.2	19,650
53.6	34	12.0	45.9	7.7	**58,215**	2,748	12.2	2,915	**20.0**	59	80	12.0	68.4	9.4	67,593
12.0	1.1	54.2	7.7	4.3	**17,057**				**5.85**	15	26.7	54.2	20.2	5.2	19,805
53.6	34	12.0	46.1	7.5	**56,834**	2,954	13.0	3,121	**18.2**	64	85	12.0	73.3	9.3	66,916
12.0	1.1	54.2	7.8	4.2	**16,652**				**5.34**	18	29.4	54.2	22.9	5.2	19,606
53.6	34	12.0	46.3	7.3	**50,150**	2,987	13.8	3,159	**15.9**	71	90	12.0	79.4	8.4	60,343
12.0	1.1	54.2	7.9	4.1	**14,694**				**4.65**	22	32.2	54.2	26.3	4.7	17,680
53.6	34	12.0	46.5	7.1	**48,819**	3,193	14.7	3,365	**14.5**	76	95	12.0	84.3	8.3	59,716
12.0	1.1	54.2	8.0	4.0	**14,304**				**4.25**	24	35.0	54.2	29.1	4.6	17,497
53.6	35	12.0	46.5	7.1	**48,409**	3,407	15.6	3,579	**13.5**	81	100	12.0	89.3	8.3	60,037
12.0	1.7	54.2	8.1	3.9	**14,184**				**3.96**	27	37.8	54.2	31.9	4.6	17,591
53.6	35	12.0	46.7	6.9	**46,968**	3,630	16.5	3,802	**12.4**	86	105	12.0	94.2	8.2	59,358
12.0	1.7	54.2	8.2	3.8	**13,762**				**3.62**	30	40.6	54.2	34.6	4.6	17,392

Compressor: ZPS51K4E-PFV

Heating Data

EMWT-75-HSCW-P-1T						Nominal 6 ton									R410a 60 Hz
Source Data (Outdoor Loop)						Power Consumption				Sink Data (Indoor Loop)					
ELT	Evap. Temp	Flow	LLT	Delta T	HAB	Total		Effective	**COPh**	EWT	Cond. Temp.	Flow	LWT	Delta T	**Net Output**
°F	°F	Igpm	°F	°F	BTU/Hr	Watts	Amps	Watts	**W/W**	°F	°F	Igpm	°F	°F	**BTU/Hr**
°C	°C	L/min	°C	°C	Watts					°C	°C	L/min	°C	°C	**Watts**
28.0	15	14.0	24.0	4.0	32,039	4,935	22.1	5,185	**2.78**	104.0	119	14.0	109.9	5.9	**49,235**
-2.2	-9.4	63.3	-4.4	2.2	9,387					40.0	48.3	63.3	43.3	3.3	**14,426**
34.0	20	14.0	29.6	4.4	35,886	4,953	22.2	5,202	**2.99**	104.0	119	14.0	110.3	6.3	**53,142**
1.1	-6.7	63.3	-1.4	2.5	10,514					40.0	48.3	63.3	43.5	3.5	**15,570**
40.0	25	14.0	35.1	4.9	39,751	5,021	22.5	5,270	**3.18**	104.0	120	14.0	110.8	6.8	**57,240**
4.4	-3.9	63.3	1.7	2.7	11,647					40.0	48.9	63.3	43.8	3.8	**16,771**
46.0	30	14.0	40.5	5.5	44,276	5,031	22.6	5,281	**3.43**	104.0	120	14.0	111.4	7.4	**61,800**
7.8	-1.1	63.3	4.7	3.0	12,973					40.0	121	63.3	44.1	4.1	**18,107**
50.0	35	14.0	44.0	6.0	49,144	5,104	22.9	5,325	**3.68**	104.0	49.4	14.0	112.0	8.0	**66,915**
10.0	1.7	63.3	6.7	3.3	14,399					40.0	49.4	63.3	44.4	4.4	**19,606**
56.0	40	14.0	49.3	6.7	54,460	5,111	22.9	5,332	**3.97**	104.0	121	14.0	112.6	8.6	**72,252**
13.3	4.4	63.3	9.6	3.7	15,957					40.0	49.4	63.3	44.8	4.8	**21,170**
62.0	45	14.0	54.7	7.3	59,755	5,174	23.2	5,395	**4.22**	104.0	122	14.0	113.3	9.3	**77,762**
16.7	7.2	63.3	12.6	4.1	17,508					40.0	50.0	63.3	45.1	5.1	**22,784**
68.0	50	14.0	59.9	8.1	65,905	5,180	23.3	5,401	**4.55**	104.0	122	14.0	114.0	10.0	**83,934**
20.0	10.0	63.3	15.5	4.5	19,310					40.0	50.0	63.3	45.6	5.6	**24,592**
Compressor: ZPS60K4E-PFV															

Cooling Data

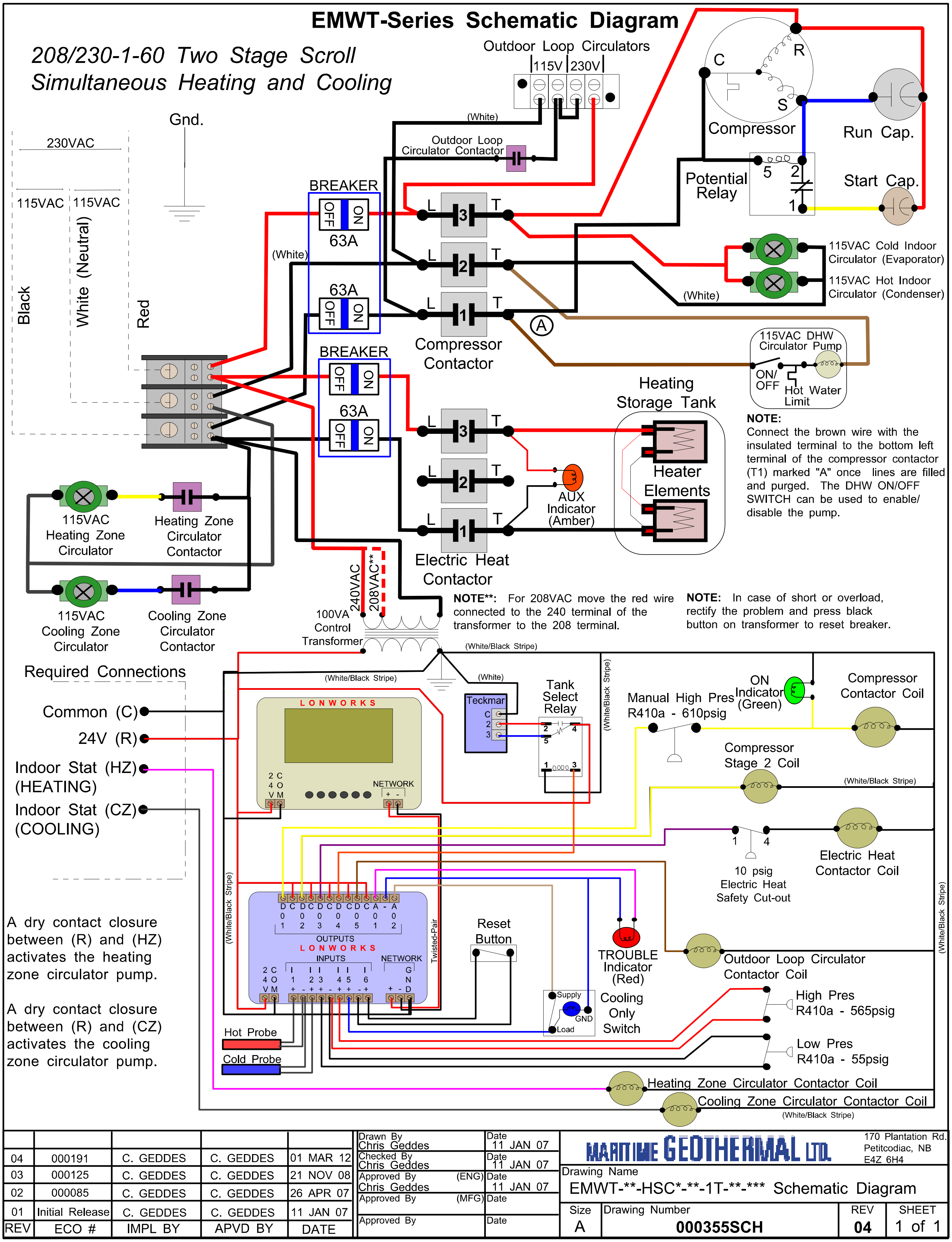
EMWT-75-HSCW-P-1T															R410a 60 Hz
Source Data (Indoor Loop)						Power Consumption				Sink Data (Outdoor Loop)					
ELT	Evap. Temp	Flow	LLT	Delta T	**HAB**	Total		Effective	**Effi-ciency**	ELT	Cond. Temp.	Flow	LLT	Delta T	Rejec-tion
°F	°F	Igpm	°F	°F	**BTU/Hr**	Watts	Amps	Watts	**EER**	°F	°F	Igpm	°F	°F	BTU/Hr
°C	°C	L/min	°C	°C	**Watts**				**COPc**	°C	°C	L/min	°C	°C	Watts
53.6	33	14.0	45.9	7.7	**69,012**	2,814	12.9	3,040	**22.7**	45	70	14.0	54.4	9.4	78,617
12.0	0.6	63.3	7.7	4.3	**20,220**				**6.65**	7	21.1	63.3	12.4	5.2	23,034
53.6	33	14.0	46.0	7.6	**67,520**	3,011	13.7	3,237	**20.9**	50	75	14.0	59.3	9.3	77,798
12.0	0.6	63.3	7.8	4.2	**19,783**				**6.11**	10	23.9	63.3	15.1	5.1	22,795
53.6	33	14.0	46.2	7.4	**65,983**	3,210	14.6	3,436	**19.2**	55	80	14.0	64.2	9.2	76,939
12.0	0.6	63.3	7.9	4.1	**19,333**				**5.63**	13	26.7	63.3	17.9	5.1	22,543
53.6	33	14.0	46.4	7.2	**64,398**	3,412	15.5	3,638	**17.7**	60	85	14.0	69.1	9.1	76,044
12.0	0.6	63.3	8.0	4.0	**18,868**				**5.19**	16	29.4	63.3	20.6	5.0	22,281
53.6	34	14.0	46.4	7.2	**60,120**	3,560	16.4	3,810	**15.8**	67	90	14.0	75.6	8.6	72,271
12.0	1.1	63.3	8.0	4.0	**17,615**				**4.62**	19	32.2	63.3	24.2	4.8	21,175
53.6	34	14.0	46.6	7.0	**58,508**	3,770	17.3	4,020	**14.6**	72	95	14.0	80.5	8.5	71,376
12.0	1.1	63.3	8.1	3.9	**17,143**				**4.26**	22	35.0	63.3	26.9	4.7	20,913
53.6	34	14.0	46.8	6.8	**56,843**	3,989	18.2	4,238	**13.4**	77	100	14.0	85.4	8.4	70,456
12.0	1.1	63.3	8.2	3.8	**16,655**				**3.93**	25	37.8	63.3	29.7	4.7	20,643
53.6	34	14.0	47.0	6.6	**55,124**	4,217	19.2	4,466	**12.3**	82	105	14.0	90.3	8.3	69,515
12.0	1.1	63.3	8.3	3.7	**16,151**				**3.62**	28	40.6	63.3	32.4	4.6	20,368
Compressor: ZPS60K4E-PFV															

Table 27 - Heat Pump Electrical Information (230-1-60)										
Model	Size	Compressor		Internal Circulators	Electric Elements	Outdoor Circulators	FLA	MCA	Max Fuse/ Breaker	Wire Size
	Tons	RLA	LRA	Amps	Amps	Max A	Amps	Amps	Amps	ga
65	5	28.6	118	2.5	48	5.0	84.9	104.1	125	#1-3
75	6	30.4	150	2.5	48	5.0	86.7	106.3	125	#1-3

Table 28 - Heat Pump Electrical Information (208-3-60)										
Model	Size	Compressor		Internal Circulators	Electric Elements	Outdoor Circulators	FLA	MCA	Max Fuse/ Breaker	Wire Size
	Tons	RLA	LRA	Amps	Amps	Max A	Amps	Amps	Amps	ga
65	5	19.6	123	2.5	43	5.0	27.9	86.6	100	#3-4
75	6	21.2	123	2.5	43	5.0	29.5	88.6	100	#3-4

Table 29 - Heat Pump Electrical Information (220-1-50)										
Model	Size	Compressor		Internal Circulators	Electric Elements	Outdoor Circulators	FLA	MCA	Max Fuse/ Breaker	Wire Size
	Tons	RLA	LRA	Amps	Amps	Max A	Amps	Amps	Amps	ga
65	5	27.3	153	2.5	46	5.0	81.6	99.9	125	#1-3
75	6	32.9	176	2.5	46	5.0	87.2	106.9	125	#1-3

Table 30 - Heat Pump Electrical Information (380-3-50)										
Model	Size	Compressor		Internal Circulators	Electric Elements	Outdoor Circulators	FLA	MCA	Max Fuse/ Breaker	Wire Size
	Tons	RLA	LRA	Amps	Amps	Max A	Amps	Amps	Amps	ga
65	5	7.1	43	2.5	46	5.0	61.4	74.7	80	#4-4
75	6	10	64	2.5	46	5.0	64.3	78.3	80	#4-4


EMWT-Series Schematic Diagram
208/230-1-60 Two Stage Scroll
Simultaneous Heating and Cooling
Outdoor Loop Circulators
115V
230V
(White)
Outdoor Loop
Circulator Contactor
Gnd.
230VAC
115VAC
115VAC
Black
White (Neutral)
Red
BREAKER
OFF
ON
63A
63A
(White)
BREAKER
63A
Compressor
Contactor
C
R
S
Compressor
Run Cap.
Potential
Relay
Start Cap.
115VAC Cold Indoor
Circulator (Evaporator)
115VAC Hot Indoor
Circulator (Condenser)
(White)
A
115VAC DHW
Circulator Pump
ON/
OFF
Hot Water
Limit
Heating
Storage Tank
Heater
Elements
AUX
Indicator
(Amber)
Electric Heat
Contactor
NOTE:
Connect the brown wire with the insulated terminal to the bottom left terminal of the compressor contactor (T1) marked "A" once lines are filled and purged. The DHW ON/OFF SWITCH can be used to enable/ disable the pump.
115VAC
Heating Zone
Circulator
Heating Zone
Circulator
Contactor
115VAC
Cooling Zone
Circulator
Cooling Zone
Circulator
Contactor
240VAC
208VAC**
100VA
Control
Transformer
NOTE**: For 208VAC move the red wire connected to the 240 terminal of the transformer to the 208 terminal.
NOTE: In case of short or overload, rectify the problem and press black button on transformer to reset breaker.
(White/Black Stripe)
Required Connections
Common (C)
24V (R)
Indoor Stat (HZ)
(HEATING)
Indoor Stat (CZ)
(COOLING)
LONWORKS
NETWORK
(White/Black Stripe)
(White)
Teckmar
Tank
Select
Relay
Manual High Pres
R410a - 610psig
ON
Indicator
(Green)
Compressor
Contactor Coil
Compressor
Stage 2 Coil
(White/Black Stripe)
10 psig
Electric Heat
Safety Cut-out
Electric Heat
Contactor Coil
OUTPUTS
LONWORKS
INPUTS
NETWORK
Twisted-Pair
Reset
Button
TROUBLE
Indicator
(Red)
Supply
GND
Load
Cooling
Only
Switch
Outdoor Loop Circulator
Contactor Coil
High Pres
R410a - 565psig
Low Pres
R410a - 55psig
A dry contact closure between (R) and (HZ) activates the heating zone circulator pump.
A dry contact closure between (R) and (CZ) activates the cooling zone circulator pump.
Hot Probe
Cold Probe
Heating Zone Circulator Contactor Coil
Cooling Zone Circulator Contactor Coil
(White/Black Stripe)
04 000191 C. GEDDES C. GEDDES 01 MAR 12
03 000125 C. GEDDES C. GEDDES 21 NOV 08
02 000085 C. GEDDES C. GEDDES 26 APR 07
01 Initial Release C. GEDDES C. GEDDES 11 JAN 07
REV ECO # IMPL BY APVD BY DATE
Drawn By Chris Geddes Date 11 JAN 07
Checked By Chris Geddes Date 11 JAN 07
Approved By (ENG) Chris Geddes Date 11 JAN 07
Approved By (MFG) Date
Approved By Date
MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4
Drawing Name
EMWT-**-HSC*-**-1T-**-*** Schematic Diagram
Size A
Drawing Number 000355SCH
REV 04
SHEET 1 of 1

EMWT-Series Electrical Box Diagram

208/230-1-60 / Two Stage Scroll / Simultaneous Heating and Cooling

Low Voltage Wiring (24VAC)

C - 24VAC Common
R - 24VAC Hot
HZ - Heating Zone Circulator
CZ - Cooling Zone Circulator

Connect R and HZ to turn on the heating zone circulator.

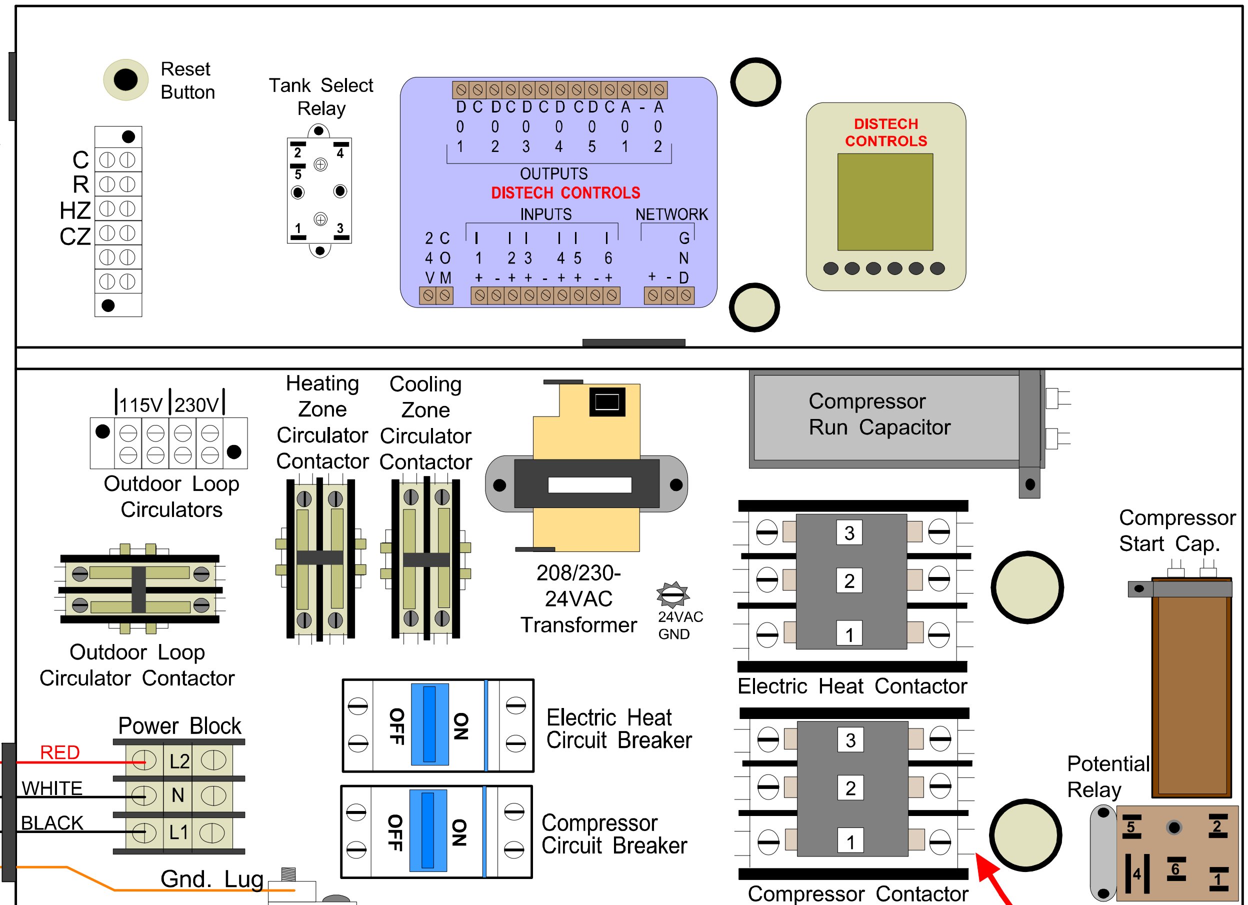
Connect R and CZ to turn on the cooling zone circulator

System Internal Voltages

230-1-60 Compressor
230-1-60 Hot Water Elements
115-1-60 Zone and Indoor Circulators
115-1-60 Domestic Hot Water Circulator

230VAC / 115VAC Outdoor Loop Circulators

Connect 115VAC circulators to 115V (LEFT)
Connect 230VAC circulators to 230V (RIGHT)
Connect "Gnd" to Gnd. Lug



208-230/115VAC CONNECTIONS		
Wire	**Colour**	**Contactor**
L2	Red	L3
N	White	L2
L1	Black	L1
Connect "Gnd" to Gnd. Lug		

IMPORTANT NOTE FOR 208-1-60 POWER
Ensure red wire is connected to the 208 terminal on the transformer instead of the 230V terminal.

Heat Pump Electrical Service Requirements
208/230VAC Single Phase 60Hz (208/230-1-60)

Model Size	Min. Circuit Ampacity	Min. Wire Gauge	TD Fuse or Breaker
65	104	#1-3	125
75	106	#1-3	125

Domestic Hot water Circulator Pump Instructions (HACW only):

If heat pump is to be operated without the hot water circulator connected to the water tank and flooded with water, remove the brown wire with the insulated terminal located here. **This pump is water lubricated and must not be run dry.** Once connected the external ON/OFF switch may be used to temporarily turn the pump off.

REV	ECO #	IMPL BY	APVD BY	DATE
04	000191	C. GEDDES	C. GEDDES	01 MAR 12
03	000125	C. GEDDES	C. GEDDES	21 NOV 08
02	000085	C. GEDDES	C. GEDDES	23 APR 07
01	Initial Release	C. GEDDES	C. GEDDES	11 JAN 07

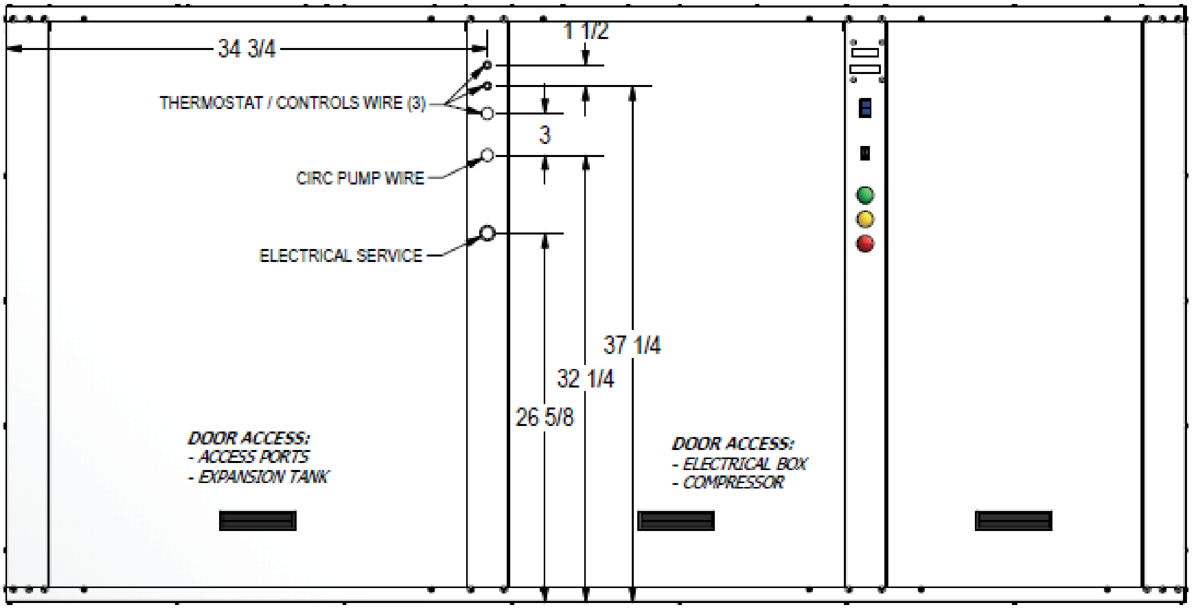
Drawn By: Chris Geddes	Date: 11 JAN 07
Checked By: Chris Geddes	Date: 11 JAN 07
Approved By (ENG): Chris Geddes	Date: 11 JAN 07
Approved By (MFG)	Date
Approved By	Date

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

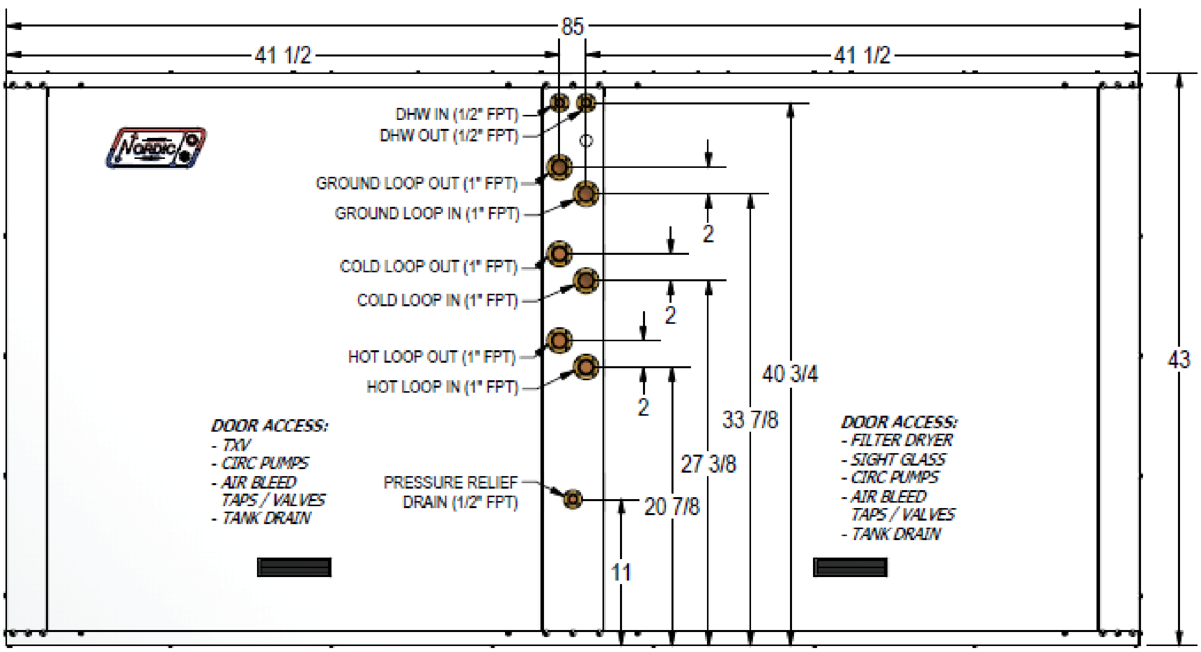
Drawing Name: EMWT-**-HSC*-**-1T-**-*** Electrical Box Diagram

Size	Drawing Number	REV	SHEET
A	000356ELB	04	1 of 1

CASE DETAILS



Front View



Back View



Right Side View

LIMITED EXPRESS WARRANTY

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Maritime Geothermal Ltd., a corporation registered in New Brunswick, Canada, ("MG") or its representatives, relating to MG's products, whether oral, written or contained in any sales literature, catalogue or agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely MG's opinion or commendation of MG's products.
EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF MG'S PRODUCTS. MG MAKES NO WARRANTY AGAINST LATENT DEFECTS. MG MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.

LIMITED EXPRESS RESIDENTIAL WARRANTY - PARTS
MG warrants its Residential Class products, purchased and retained in the United States of America and Canada, to be free from defects in material and workmanship under normal use and maintenance as follows:
(1) Air conditioning, heating and/or heat pump units built or sold by MG ("MG Units") for five (5) years from the Warranty Inception Date (as defined below).
(2) Thermostats, auxiliary electric heaters and geothermal pumping modules built or sold by MG, when installed with MG Units, for five (5) years from the Warranty Inception Date (as defined below).
(3) Sealed refrigerant circuit components of MG Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for ten (10) years from the Warranty Inception Date (as defined below).
(4) Other accessories and parts built or sold by MG, when installed and purchased with MG Units, for five (5) years from the date of shipment from MG.
(5) Other accessories, when purchased separately, for (1) year from the date of shipment from MG.

The "Warranty Inception Date" shall be the date of original unit installation, as per the date on the installation Startup Record or six (6) months from date of unit shipment from MG, whichever comes first.

To make a claim under this warranty, parts must be returned to MG in Petitcodiac, New Brunswick, freight prepaid, no later than ninety (90) days after the date of the failure of the part. If MG determines the part to be defective and within MG's Limited Express Residential Warranty, MG shall, when such part has been either replaced or repaired, return such to a factory recognized distributor, dealer or service organization, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

LIMITED EXPRESS RESIDENTIAL WARRANTY - LABOUR
This Limited Express Residential Labour Warranty shall cover the **labour** incurred by MG authorized service personnel in connection with the installation of a new or repaired warranty part that is covered by this Limited Express Residential Warranty only to the extent specifically set forth in the current **labour** allowance schedule "A" provided by MG's Warranty Department and only as follows:
(1) MG Units for two (2) years from the Warranty Inception Date.
(2) Thermostats, auxiliary electric heaters and geothermal pump modules built or sold by MG, when installed with MG Units, for two (2) years from the Warranty Inception Date.
(3) Sealed refrigerant circuit components of MG Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for five (5) years from the Warranty Inception Date.

Labour costs are not covered by this Limited Express Residential Warranty to the extent they **exceed** the amount allowed under said allowance schedule, they are not specifically provided for in said allowance schedule, they are not the result of work performed by MG authorized service personnel, they are incurred in connection with a part not covered by this Limited Express Residential Warranty, or they are incurred more than the time periods set forth in this paragraph after the Warranty Inception Date.
This warranty does not cover and does not apply to:
(1) Air filters, fuses, refrigerant, fluids, oil.
(2) Products relocated after initial installation.
(3) Any portion or component of any system that is not supplied by MG, regardless of the cause of the failure of such portion or component.
(4) Products on which the unit identification tags or labels have been removed or defaced.
(5) Products on which payment to MG, or to the owner's seller or installing contractor, is in default.
(6) Products subjected to improper or inadequate installation, maintenance, repair, wiring or voltage conditions.
(7) Products subjected to accident, misuse, negligence, abuse, fire, flood, lightning, unauthorized alteration, misapplication, contaminated or corrosive liquid or air supply, operation at abnormal air or liquid temperatures or flow rates, or opening of the refrigerant circuit by unqualified personnel.
(8) Mold, fungus or bacteria damage
(9) Corrosion or abrasion of the product.
(10) Products supplied by others.
(11) Products which have been operated in a manner contrary to MG's printed instructions.
(12) Products which have insufficient performance as a result of improper system design or improper application, installation, or use of MG's products.
(13) Electricity or fuel, or any increases or unrealized savings in same, for any reason whatsoever.

Except for the limited **labour** allowance coverage set forth above, MG is not responsible for:
(1) The costs of fluids, refrigerant or system components **supplied by others**, or associated **labour** to repair or replace the same, which is incurred as a result of a defective part covered by MG's Limited Residential Warranty.
(2) The costs of **labour**, refrigerant, materials or service incurred in diagnosis and removal of the defective part, or in obtaining and replacing the new or repaired part.
(3) Transportation costs of the defective part from the installation site to MG, or of the return of that part if not covered by MG's Limited Express Residential Warranty.
(4) The costs of normal maintenance.

This Limited Express Residential Warranty applies to MG Residential Class products manufactured on or after February 15, 2010. MG'S LIABILITY UNDER THE TERMS OF THIS LIMITED WARRANTY SHALL APPLY ONLY TO THE MG UNITS REGISTERED WITH MG THAT BEARS THE MODEL AND SERIAL NUMBERS STATED ON THE INSTALLATION START UP RECORD, AND MG SHALL NOT, IN ANY EVENT, BE LIABLE UNDER THE TERMS OF THIS LIMITED WARRANTY UNLESS THIS INSTALLATION START UP RECORD HAS BEEN ENDORSED BY OWNER & DEALER/INSTALLER AND RECIEVED BY MG LIMITED WITHIN 90 DAYS OF START UP.

Limitation: This Limited Express Residential Warranty is given in lieu of all other warranties. If, not withstanding the disclaimers contained herein, it is determined that other warranties exist, any such express warranty, including without imitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Residential Warranty.

LIMITATION OF REMEDIES In the event of a breach of the Limited Express Residential Warranty, MG will only be obligated at MG's option to repair the failed part or unit, or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to MG's factory in Petitcodiac, New Brunswick of each defect, malfunction or other failure, and a reasonable number of attempts by MG to correct the defect, malfunction or other failure, and the remedy fails of its essential purpose, MG shall refund the purchase price paid to MG in exchange for the return of the sold good(s). Said refund shall be the maximum liability of MG. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR PURCHASER AGAINST MG FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR MG'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY MG shall have no liability for any damages if MG's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes, or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labour, acts of God or any other reason beyond the sole control of MG. **MG EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR MG's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE Normally, the dealer or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any MG recognized distributor, dealer or service organization. If assistance is required in obtaining warranty performance, write or call: Maritime Geothermal Ltd • Customer Service • PO Box 2555 • Petitcodiac, New Brunswick E4Z 6H4 • (506) 756-8135 • or e-mail to info@nordicghp.com NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusions of consequential or incidental damages, so the foregoing exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province. Please refer to the MG Installation, Installation and Service Manual for operating and maintenance instructions.

An extended warranty option is also available. Please contact Maritime Geothermal Ltd. via the contact information in the previous paragraph for more information.